

SMNSR - WR-000017 - 2016.001  
Synthetic Minor NSR Permit

Marathon Oil Corporation  
Rocky Mountain Operation  
1501 Stampede Avenue  
Cody, Wyoming 82414



Claudia Young Smith  
U.S. Environmental Protection Agency  
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1595 Wynkoop Street, 8P-AR  
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Dean Goggles  
Wind River Environmental Quality Commission  
P.O. Box 217  
Fort Washakie, WY 82514

May 13, 2016

RE: Federal New Source Review Program Synthetic Minor Application in Indian Country  
Wind River Indian Reservation  
Marathon Oil Corporation – Maverick Springs Tank Battery  
Fremont County, Wyoming

Dear Officers,

Marathon Oil Company (Marathon) is submitting the enclosed Federal New Source Review (NSR) Program application for a synthetic minor source permit to emit regulated air pollutants at the Maverick Springs Tank Battery (the facility) pursuant to the requirements of 40 CFR §49.153(a)(3). The facility, located in Fremont County, Wyoming on the Wind River Indian Reservation, is an oil and gas production facility subject to the Federal Implementation Plan (FIP) under 40 CFR §49.151, Subpart C [See 40 CFR §49.153(c)]. Marathon is submitting this application to obtain a federally enforceable limit on the potential to emit (PTE) of criteria air pollutants under a synthetic minor source permit pursuant to 40 CFR §49.153(a)(3).

Please find enclosed the NEW and SYNMIN forms, along with all the applicable components needed for the application, as required under 40 CFR §49.158. If you have any questions concerning this submittal, please contact Donna Stevison at [dmstevison@marathonoil.com](mailto:dmstevison@marathonoil.com) or (307) 527-2121.

Sincerely,

A handwritten signature in black ink, appearing to read "Jon Salomonsen".

Jon Salomonsen  
Operations Manager

Enclosure: Synthetic Minor Permit Application, Maverick Springs Tank Battery

Marathon Oil, Corporation



# **FEDERAL NEW SOURCE REVIEW APPLICATION FOR SYNTHETIC MINOR SOURCE PERMIT**

Maverick Springs Tank Battery

Oil and Gas Production Facility

May 2016

FEDERAL NEW SOURCE REVIEW  
APPLICATION FOR SYNTHETIC  
MINOR SOURCE PERMIT

Marathon Oil, Corporation  
Oil and Gas Production Facility

Prepared for:

Marathon Oil Corporation (MRO)

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## ACRONYMS AND ABBREVIATIONS

40 CFR	Title 40 of the United States Code of Federal Regulations
AP-42	EPA's AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition
bbbl	Barrel
BOPY	Barrels of Oil per Year
BRE	Bryan Research & Engineering
BWPD	Barrels of Water per Day
DRE	Destruction and Removal Efficiency
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
GPM	Gallons per Minute
H <sub>2</sub> S	Hydrogen Sulfide
HAP	Hazardous Air Pollutant
lb	Pound
lb-mol	Pound-Mole
MACT	Maximum Achievable Control Technology
Mgal	1,000 gallons
MRO	Marathon Oil Corporation
MSS	Maintenance, Startup, and Shutdown
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NO <sub>x</sub>	Oxides of Nitrogen
NSPS	New Source Performance Standards
NSR	New Source Review
ppmv	Parts per Million by Volume
PSD	Federal Clean Air Act, Part C
psia	Pounds per Square Inch (absolute)
psig	Pounds per Square Inch (gauge)
RVP	Reid Vapor Pressure
SO <sub>2</sub>	Sulfur Dioxide
tpy	Tons per Year
VOC	Volatile Organic Compound

# 1 INTRODUCTION

Marathon Oil, Corporation (MRO) owns and operates the oil and gas production facility known as the Maverick Springs Tank Battery (facility). The facility is located in Fremont County, Wyoming on the Wind River Indian Reservation. The facility is an oil and gas production facility subject to Federal Implementation Plan (FIP) for under 40 CFR §49.151, Subpart C [See 40 CFR §49.153(c)]. Further, Fremont County is designated as attainment/unclassifiable for all criteria pollutants. As such, the facility is required to comply with the Clean Air Act (CAA) under the permitting authority of the Environmental Protection Agency (EPA) Region 8 Federal Minor New Source Review Program in Indian Country under 40 CFR §49, Subpart C.

MRO respectfully submits this application for a synthetic minor source permit in accordance with 40 CFR §49.158 to emit regulated air pollutants and establish federally enforceable limits at the facility pursuant to 40 CFR §49.153(a)(3). With the issuance of the requested permit, the facility will not have a potential to emit (PTE) criteria air pollutants at or above the major source thresholds as defined in 40 CFR §52.21(b)(1). The facility is an oil and gas production facility. Therefore, it is not a listed source category under 40 CFR §52.21(b)(1) and would be considered a major source if the PTE of any criteria pollutant is greater than or equal to 250 tons per year (tpy). As summarized in Table 3-1, the PTE, calculated as defined in 40 CFR §49.152 and 40 CFR §52.21(b)(1) for non-named sources, for each criteria pollutant is less than 250 tpy. Federal major new source review and prevention of significant deterioration (PSD) review are not triggered.

Additionally, Title V permitting requirements will not be triggered since the Title V major source thresholds, as defined in 40 CFR §71.2, are not exceeded: 100 tpy for each criteria pollutant, 25 tpy for total hazardous air pollutants (HAPs), 10 tpy for any single HAP.

This report includes all required elements for a synthetic minor source permit defined in 40 CFR §49.158(a)(1). As applicable, this information is provided on the required Tribal NSR Synthetic Minor application materials including the FORM SYNMIN and FORM NEW provided in Appendix B.

## 2 PROCESS DESCRIPTION AND PROCESS FLOW DIAGRAM

The Maverick Springs Tank Battery will operate 24 hours a day, 7 days a week, and 52 weeks a year, for a total annual hours of 8,760. The facility is requesting to handle up to 1,800-bbl per day of crude oil (BOPD), 77,763-bbl per day of produced water (BWPD) and 15 thousand standard cubic feet per day (Mscfd) of produced gas. The produced gas from the facility contains up to 50,000 parts per million (ppm) hydrogen sulfide (H<sub>2</sub>S).

Production from the wells enters the Maverick Springs Tank Battery through four inlet free water knockouts (FWKO). From the FWKOs, the oil/gas emulsion is sent to two heater treaters (HT-1 & HT-2) for secondary separation of the gas, oil and produced water. The produced water that is separated from the FWKOs and the heater treaters, is then routed to three 1,000-bbl produced water skim tanks (WTK-1, WTK-2 & WTK-3). Vapors from the three skim tanks are vented to atmosphere. After the produced water enters the skim tanks, it is sent to two open water pits, where it is released via surface water discharge.

Produced gas that is flashed off of the heater treaters is routed to a process flare (FL-1) for control. Oil that is separated out of the heater treater is sent to a 400 barrel (bbl) crude oil run tank (CTK-1) before it is routed to a lease-activated custody transfer (LACT) Unit and then to the sales pipeline. During non-normal operating conditions, reject or overflow oil will be directed to either a 1,000 bbl reject oil tank (CTK-3), or a 1,000 bbl overflow (CTK-2) tank. An additional 500-bbl steamer tank is on-site and is used in non-normal operating conditions (CTK-4). Vapors from the crude oil run tank and all other storage tanks will vent to atmosphere.

The produced gas from the facility that is sent to gas injection contains 50,000 ppm H<sub>2</sub>S. A process flow diagram is provided in Figure 2-1.

A summary of the equipment at the facility is presented in Table 2-1.

Table 2-1. Summary of Equipment

Equipment ID	Equipment Description	Capacity/Design Rate	Controls
FL-1	Process Flare	TBD	N/A
CTK-1	Crude Oil Sales Tank	300 bbl	FL-1
CTK-2	Crude Oil Overflow Tank	300 bbl	None
CTK-3	Crude Oil Reject Tank	300 bbl	None
CTK-4	Crude Oil Slop Tank	300 bbl <i>or 500 ?</i>	None
WTK-1	Produced Water Skim Tank	1,000 bbl	None
WTK-2	Produced Water Skim Tank	1,000 bbl	None
WTK-3	Produced Water Skim Tank	1,000 bbl	None
HT-1	Heater Treater #1	1 MMbtu/hr	FL-1
HT-2	Heater Treater #2	1 MMbtu/hr	FL-1
MSS-DEGAS	Tank Degassing	N/A	None

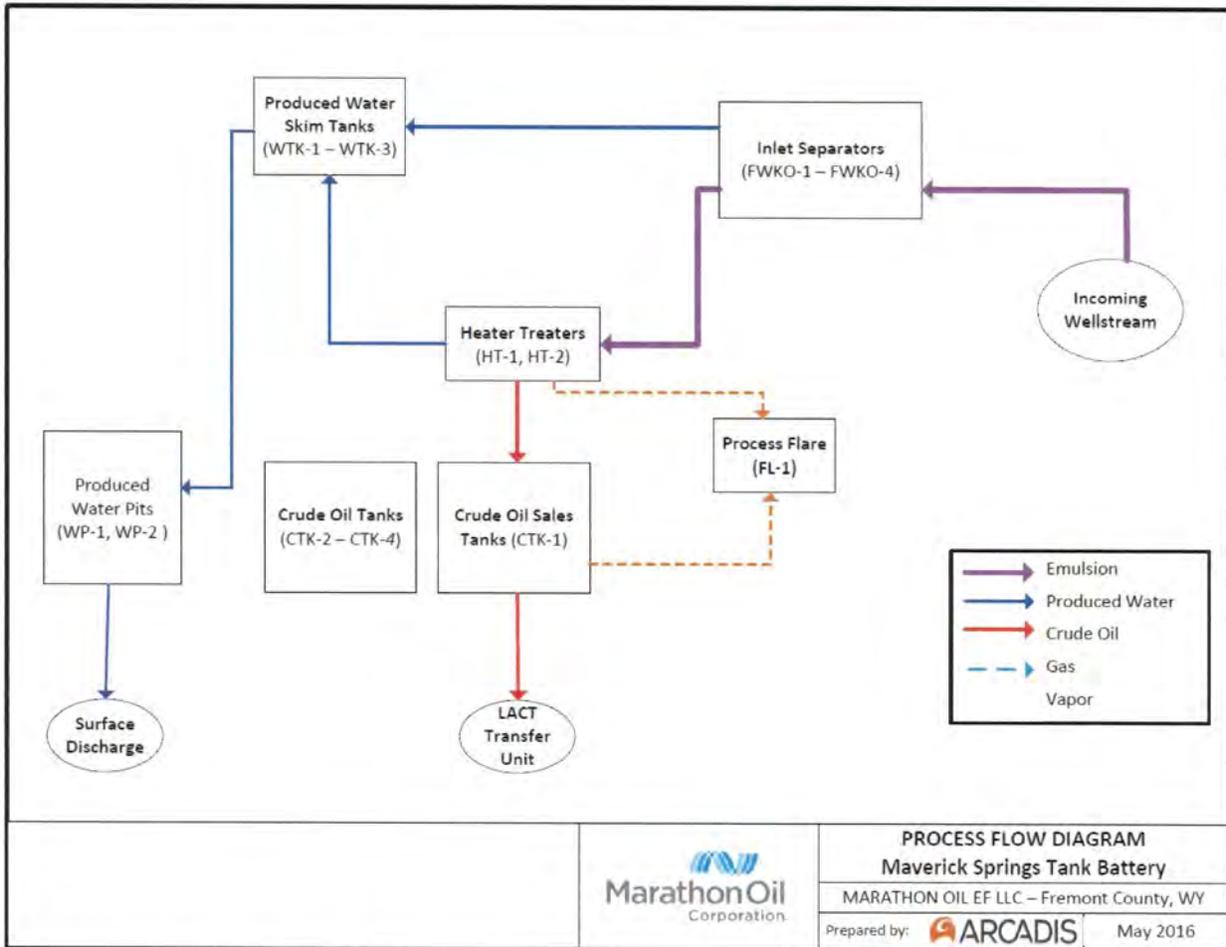


Figure 1. Process Flow Diagram

## 3 EMISSIONS SUMMARY

The maximum allowable air pollutant emission rates proposed for each emission source at the facility are presented in Table 3-1, and the maximum uncontrolled PTE air pollutant emission rates are presented in Table 3-2. Detailed emission calculations for the proposed equipment and operations are presented in Appendix A.

### 3.1 Emissions Calculations

Emissions of Volatile Organic Compounds (VOCs) from material phase change such as loading, flashing, and tank losses were calculated using the ProMax Process Simulator published by Bryan Research and Engineering (BRE). This process simulator Emission calculation tables are provided in Appendix A.

#### 3.1.1 Gas and Liquid Analyses

The composition and physical properties of the crude oil were taken from a GPA 2145-00 lab analysis of oil that was collected from the outlet of the heater treaters. The produced gas properties were taken from a site-specific flash liberation analyses from the inlet well stream, which was collected from the inlet to the FWKO. Laboratory analyses are provided in Appendix C.

#### 3.1.2 Storage Tank Emissions

Emissions of volatile organic compounds (VOC), H<sub>2</sub>S, and hazardous air pollutants (HAP)s from the oil and water storage tanks were estimated using BRE ProMax Process Simulator (ProMax). This model accounts for both flash emissions from the change in liquid stream pressure from the separator to ambient conditions and the working and breathing losses. The emissions are based on the maximum annual capacity production rates for oil and water, design operating pressure and temperature of separators, and the material analyses as discussed in Section 3.1.1. Flashing emissions from the crude oil and produced gas were accounted for at the two heater treaters (HT-1 & HT-2), which are controlled by the process flare (FL-1). Working, breathing, and additional flashing emissions from the produced water and crude oil tanks are based on the maximum storage tank liquid surface temperature obtained from AP-42, Chapter 7.1 for Cheyenne, Wyoming. Emissions from the three 1,000-bbl produced water tanks (WTK1, WTK-2 & WTK-3) are not controlled and vent to atmosphere.

All crude oil that is routed to the sales pipeline flows through the 300-bbl crude oil run tank (CTK-1). The 300-bbl reject tank (CTK-3), 300-bbl overflow tank (CTK-2), and 300-bbl slop tank (CTK-4) are not used during normal operating conditions. The overflow tank and the slop tank are used for maintenance and upset conditions, and the reject oil tank is used for the storage & recycling of oil that cannot be sent to sales. Volumes of oil sent to the overflow, reject and slop tanks represent maximum actual volumes for an entire year. Emissions from crude oil storage tanks (CTK-1, CTK-2, CTK-3 and CTK-4) are not controlled, and will vent to atmosphere.

Detailed process streams provided by ProMax, and emission calculations are presented in Appendix A.

### **3.1.3 Fugitive Emissions**

The Maverick Springs Battery is an oil and gas production facility and is not listed in one of the source categories listed in part 51, Appendix S, paragraph II.A.4(iii) or §52.21(b)(1)(iii). Therefore, fugitive emissions are not considered for the determination of PTE or allowable emissions for this synthetic minor application.

### **3.1.4 External Combustion Unit Emissions**

The two heater treaters (HT-1 & HT-2) at the facility are fuelled by propane. Emissions from the heater treaters were estimated using emission factors from USEPA AP-42 Chapter 1.5 Liquefied Petroleum Gas (LPG) Combustion, dated July 2008 for small boilers, the maximum design heat input rating, and annual hours of operation. Total annual propane usage for the two heaters will be 191,476 gallons.

### **3.1.5 Flare Emissions**

Controlled emissions from the flare were estimated using the Draft TCEQ Technical Guidance Package (RG-109) for Flares and Vapor Oxidizers, dated October 2000, based on the maximum expected flow rate and heating value of each stream routed to the flare. The gas flow includes a pilot gas stream of propane. The maximum flow rates and heating values were estimated using ProMax and are provided in Appendix A. Emissions factors for nitrogen oxides (NO<sub>x</sub>) and carbon monoxide (CO) were used in accordance with the Technical Guidance for this unassisted flares. Emissions of sulfur dioxide (SO<sub>2</sub>) were calculated based on a mass balance from H<sub>2</sub>S concentration in the produced gas, and a maximum annual produced gas volumetric flow rate. The flare is conservatively assumed to operate 90% of the year to account for any maintenance and flare downtime. Produced gas at the facility can contain up to 50,000 ppm H<sub>2</sub>S.

The flare will be designed to be in compliance 40 CFR §60.18 specifications and as such, is assumed to operate with a destruction efficiency and removal (DRE) of 98 percent. The flare is unassisted and operates with an automatic ignition system to ensure the flare is constantly available; however, emissions conservatively assume a constantly lit pilot.

### **3.1.6 Greenhouse Gas Emissions**

Greenhouse Gas (GHG) emissions from the storage tanks at the facility were calculated for carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) from mass balances. GHG emissions from the external combustion units were estimated using GHG factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion. GHG emissions from the flare were calculated based on the gas heat input rates and the CO<sub>2</sub>, CH<sub>4</sub>, and nitrous oxide (N<sub>2</sub>O) emission factors for fuel gas provided in 40 CFR Part 98 - Mandatory Greenhouse Gas Reporting, Subpart C, Tables C-1 and C-2. Equivalent carbon dioxide emissions (CO<sub>2</sub>e) were estimated based on individual GHG emissions and the Global Warming Potentials (GWP) provided in 40 CFR Part 98, Subpart A, Table A-1.

### **3.2 Maintenance, Startup and Shutdown (MSS)**

In addition to the normal operation emission sources, MRO is requesting to include the following planned MSS operations into the total annual emissions for the Circle Ridge Tank Battery:

- Tank Vent Degassing (MSS-DEGAS);

Tank Vent Degassing Losses were estimated for each of the storage tanks at the facility, and the emissions are uncontrolled. Crude oil tanks are cleaned once per year assuming each tank takes one hour to clean. Produced water tanks are also cleaned once per year, assuming each tank takes twelve hours to clean. Tanks operate at atmospheric conditions. Degassing emissions are based on the ideal gas law.

Marathon Oil, LLC  
Maverick Spring Tank Battery  
Emissions Summary

Table 3-1. Proposed Allowable Maximum Air Pollutant Emission Rates

Emission Source	EPN	VOC		NO <sub>x</sub>		CO		PM <sub>10</sub>		PM <sub>2.5</sub>		SO <sub>2</sub>		lbs/hr
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	
Process Flare	FL-1	0.47	2.05	0.04	0.16	0.31	1.36	4.20E-03	0.02	4.20E-03	0.02	0.24	1.03	2.51E-0
Crude Oil Overflow Tank	CTK-1	27.11	12.24	--	--	--	--	--	--	--	--	--	--	0.20
Crude Oil Reject Tank	CTK-2	0.16	0.71	--	--	--	--	--	--	--	--	--	--	1.05E-0
Crude Oil Steamer Tank	CTK-3	0.22	0.94	--	--	--	--	--	--	--	--	--	--	2.75E-0
Crude Oil Slop Oil Tank	CTK-4	0.22	0.94	--	--	--	--	--	--	--	--	--	--	2.75E-0
Produced Water Skim Tank #1	WTK-1	5.55	15.33	--	--	--	--	--	--	--	--	--	--	0.15
Produced Water Skim Tank #2	WTK-2	5.55	15.33	--	--	--	--	--	--	--	--	--	--	0.15
Produced Water Skim Tank #3	WTK-3	5.55	15.33	--	--	--	--	--	--	--	--	--	--	0.15
Heater Treater #1	HT-1	1.20E-05	5.27E-05	1.64E-04	7.18E-04	9.18E-05	4.02E-04	8.74E-06	3.83E-05	8.74E-06	3.83E-05	9.84E-07	4.31E-06	--
Heater Treater #2	HT-2	1.20E-05	5.27E-05	1.64E-04	7.18E-04	9.18E-05	4.02E-04	8.74E-06	3.83E-05	8.74E-06	3.83E-05	9.84E-07	4.31E-06	--
Tank Degassing	MSS-DEGAS	126.81	0.06	--	--	--	--	--	--	--	--	--	--	3.16
<b>TOTAL EMISSIONS:</b>		<b>171.64</b>	<b>62.95</b>	<b>0.04</b>	<b>0.16</b>	<b>0.31</b>	<b>1.36</b>	<b>4.22E-03</b>	<b>0.02</b>	<b>4.22E-03</b>	<b>0.02</b>	<b>0.24</b>	<b>1.03</b>	<b>3.80</b>
<b>MAXIMUM OPERATING SCHEDULE:</b>		Hours/Day		24		Days/Week		7		Weeks/Year		52		

Marathon Oil, LLC  
Maverick Spring Tank Battery  
Emissions Summary

Table 3-1. Proposed Allowable Maximum Air Pollutant Emission Rates

Emission Source	EPN	VOC		NO <sub>x</sub>		CO		PM <sub>10</sub>		PM <sub>2.5</sub>		SO <sub>2</sub>		H <sub>2</sub> S		Benzene		HAP	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Process Flare	FL-1	0.47	2.05	0.04	0.16	0.31	1.36	4.20E-03	0.02	4.20E-03	0.02	0.24	1.03	2.51E-03	0.01	6.38E-04	2.79E-03	0.01	0.04
Crude Oil Overflow Tank	CTK-1	27.11	12.24	--	--	--	--	--	--	--	--	--	--	0.20	0.16	0.04	0.01	0.66	0.22
Crude Oil Reject Tank	CTK-2	0.16	0.71	--	--	--	--	--	--	--	--	--	--	1.05E-03	4.60E-03	1.51E-04	6.60E-04	0.16	0.01
Crude Oil Steamer Tank	CTK-3	0.22	0.94	--	--	--	--	--	--	--	--	--	--	2.75E-03	0.01	2.00E-04	8.75E-04	3.90E-03	0.02
Crude Oil Slop Oil Tank	CTK-4	0.22	0.94	--	--	--	--	--	--	--	--	--	--	2.75E-03	0.01	2.00E-04	8.75E-04	3.90E-03	0.02
Produced Water Skim Tank #1	WTK-1	5.55	15.33	--	--	--	--	--	--	--	--	--	--	0.15	0.32	0.02	0.03	0.05	0.15
Produced Water Skim Tank #2	WTK-2	5.55	15.33	--	--	--	--	--	--	--	--	--	--	0.15	0.32	0.02	0.03	0.05	0.15
Produced Water Skim Tank #3	WTK-3	5.55	15.33	--	--	--	--	--	--	--	--	--	--	0.15	0.32	0.02	0.03	0.05	0.15
Heater Treater #1	HT-1	1.20E-05	5.27E-05	1.64E-04	7.18E-04	9.18E-05	4.02E-04	8.74E-06	3.83E-05	8.74E-06	3.83E-05	9.84E-07	4.31E-06	--	--	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Heater Treater #2	HT-2	1.20E-05	5.27E-05	1.64E-04	7.18E-04	9.18E-05	4.02E-04	8.74E-06	3.83E-05	8.74E-06	3.83E-05	9.84E-07	4.31E-06	--	--	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Tank Degassing	MSS-DEGAS	126.81	0.06	--	--	--	--	--	--	--	--	--	--	3.16	1.58E-03	0.12	5.98E-05	2.29	1.14E-03
TOTAL EMISSIONS:		<b>171.64</b>	<b>62.95</b>	<b>0.04</b>	<b>0.16</b>	<b>0.31</b>	<b>1.36</b>	<b>4.22E-03</b>	<b>0.02</b>	<b>4.22E-03</b>	<b>0.02</b>	<b>0.24</b>	<b>1.03</b>	<b>3.80</b>	<b>1.17</b>	<b>0.21</b>	<b>0.10</b>	<b>3.29</b>	<b>0.76</b>
MAXIMUM OPERATING SCHEDULE:		Hours/Day		24		Days/Week		7		Weeks/Year		52		Hours/Year		8760			

Marathon Oil . LLC  
 Maverick Spring Tank Battery  
 Emissions Summary

Table 3-2. Uncontrolled PTE Maximum Air Pollutant Emission Rates

Emission Source	EPN	VOC		NO <sub>x</sub>		CO		PM <sub>10</sub>		PM <sub>2.5</sub>		SO <sub>2</sub>		H <sub>2</sub> S		Benzene		HAP	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Process Flare	FL-1	19.60	65.96	0.03	0.14	0.27	1.17	3.63E-03	--	3.63E-03	--	0.26	--	0.14	0.61	0.04	0.16	0.54	2.35
Crude Oil Overflow Tank	OTK-1	27.11	12.24	--	--	--	--	--	--	--	--	--	--	0.20	0.16	0.04	0.01	0.66	0.22
Crude Oil Roved Tank	CTK-2	0.16	0.71	--	--	--	--	--	--	--	--	--	--	1.05E-03	4.60E-03	1.51E-04	6.80E-04	0.16	0.01
Crude Oil Steamer Tank	CTK-3	0.22	0.94	--	--	--	--	--	--	--	--	--	--	2.75E-03	0.01	2.00E-04	8.75E-04	3.90E-03	0.02
Crude Oil Slop Oil Tank	CTK-4	0.22	0.94	--	--	--	--	--	--	--	--	--	--	2.75E-03	0.01	2.00E-04	8.75E-04	3.90E-03	0.02
Produced Water Skim Tank #1	WTK-1	5.55	15.33	--	--	--	--	--	--	--	--	--	--	0.15	0.32	0.02	0.03	0.05	0.15
Produced Water Skim Tank #2	WTK-2	5.55	15.33	--	--	--	--	--	--	--	--	--	--	0.15	0.32	0.02	0.03	0.05	0.15
Produced Water Skim Tank #3	WTK-3	5.55	15.33	--	--	--	--	--	--	--	--	--	--	0.15	0.32	0.02	0.03	0.05	0.15
Heater Treater #1	HT-1	1.20E-05	5.27E-05	1.64E-04	7.18E-04	9.18E-05	4.02E-04	8.74E-06	3.83E-05	8.74E-06	3.83E-05	9.84E-07	4.31E-06	--	--	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Heater Treater #2	HT-2	1.20E-05	5.27E-05	1.64E-04	7.18E-04	9.18E-05	4.02E-04	8.74E-06	3.83E-05	8.74E-06	3.83E-05	9.84E-07	4.31E-06	--	--	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Tank Degassing	MSS-DEGAS	126.61	0.06	--	--	--	--	--	--	--	--	--	--	3.16	1.58E-03	0.12	5.98E-05	2.29	1.14E-03
TOTAL EMISSIONS:		190.78	146.75	0.03	0.14	0.27	1.17	3.65E-03	7.66E-05	3.65E-03	7.66E-05	0.26	8.62E-06	3.94	1.77	0.25	0.25	3.82	3.06
MAXIMUM OPERATING SCHEDULE:		Hours/Day		24	Days/Week		7	Weeks/Year		52	Hours/Year		8760						

Marathon Oil, LLC  
 Maverick Spring Tank Battery  
 Emissions Summary

Table 3-2. Uncontrolled PTE Maximum Air Pollutant Emission Rates

Emission Source	EPN	VOC		NO <sub>x</sub>		CO		PM <sub>10</sub>		PM <sub>2.5</sub>		SO <sub>2</sub>		H <sub>2</sub> S		Bt
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	
Process Flare	FL-1	19.60	85.86	0.03	0.14	0.27	1.17	3.63E-03	—	3.63E-03	—	0.26	—	0.14	0.61	0.04
Crude Oil Overflow Tank	CTK-1	27.11	12.24	—	—	—	—	—	—	—	—	—	—	0.20	0.16	0.04
Crude Oil Reject Tank	CTK-2	0.16	0.71	—	—	—	—	—	—	—	—	—	—	1.05E-03	4.80E-03	1.51E-03
Crude Oil Steamer Tank	CTK-3	0.22	0.94	—	—	—	—	—	—	—	—	—	—	2.75E-03	0.01	2.00E-03
Crude Oil Strip Oil Tank	CTK-4	0.22	0.94	—	—	—	—	—	—	—	—	—	—	2.75E-03	0.01	2.00E-03
Produced Water Skim Tank #1	WTK-1	5.55	15.33	—	—	—	—	—	—	—	—	—	—	0.15	0.32	0.02
Produced Water Skim Tank #2	WTK-2	5.55	15.33	—	—	—	—	—	—	—	—	—	—	0.15	0.32	0.02
Produced Water Skim Tank #3	WTK-3	5.55	15.33	—	—	—	—	—	—	—	—	—	—	0.15	0.32	0.02
Heater Treater #1	HT-1	1.20E-05	5.27E-05	1.64E-04	7.18E-04	9.18E-05	4.02E-04	8.74E-06	3.83E-05	8.74E-06	3.83E-05	9.84E-07	4.31E-06	—	—	2.30E-01
Heater Treater #2	HT-2	1.20E-05	5.27E-05	1.64E-04	7.18E-04	9.18E-05	4.02E-04	8.74E-06	3.83E-05	8.74E-06	3.83E-05	9.84E-07	4.31E-06	—	—	2.30E-01
Tank Degassing	MSS-DEGAS	126.81	0.06	—	—	—	—	—	—	—	—	—	—	3.16	1.58E-03	0.12
<b>TOTAL EMISSIONS</b>		<b>190.78</b>	<b>146.76</b>	<b>0.03</b>	<b>0.14</b>	<b>0.27</b>	<b>1.17</b>	<b>3.65E-03</b>	<b>7.66E-05</b>	<b>3.65E-03</b>	<b>7.66E-05</b>	<b>0.26</b>	<b>6.62E-06</b>	<b>3.94</b>	<b>1.77</b>	<b>0.25</b>
<b>MAXIMUM OPERATING SCHEDULE:</b>		<b>Hours/Day</b>		<b>24</b>		<b>Days/Week</b>		<b>7</b>		<b>Weeks/Year</b>		<b>52</b>		<b>Hours/Year</b>		

## 4 COMPLIANCE WITH FEDERAL AND TRIBAL NSR SYNTHETIC MINOR PERMITTING REQUIREMENTS

A summary of compliance with applicable federal requirements, including applicable NSPS regulations is provided in Tables 4-2. Information required in Section B. of the Tribal NSR Synthetic Minor application form (SYNMIN) is provided below.

### 4.1 Tribal NSR Application Form Information

#### Item 1

MRO is proposing to limit the PTE of the facility emissions by limiting the annual crude oil throughput to 657,000 barrels of oil per year (BOPY), the annual produced water throughput to 28,383,495 barrels of water per year (BWPY). Additionally, MRO is requesting to permit a process flare with a federally enforceable limit on PTE. The flare will operate with a 98% destruction efficiency for VOC and H<sub>2</sub>S emissions, as described in section 3.1.2. As summarized in Table 3-2, the uncontrolled PTE rates for VOC are greater than 100 tpy with the throughput limitation. The flare will limit the site-wide PTE for VOC emissions from 146.76 tpy to 62.95 tpy, as shown in Table 3-1 and Table 3-2. These will serve as practically enforceable limits (as defined in 40 CFR §49.152) in order to establish PTE less than the major source threshold of 100 tpy for criteria pollutants, as defined in 40 CFR §71.2. MRO is requesting these limits and requirements in order to avoid the major source threshold of 100 tpy for criteria pollutants, as defined in 40 CFR §71.2. With the proposed federally enforceable limits on PTE, Title V permitting requirements will not be triggered since the Title V major source thresholds are not exceeded (100 tpy for each criteria pollutant, 25 tpy for total hazardous air pollutants (HAPs), and 10 tpy for any single HAP). The facility is not a named source; therefore, fugitive emissions are not required to be included in the assessment of Title V applicability.

#### Item 2

MRO will demonstrate compliance with throughput limitations by recording the daily production rates of crude oil and produced water, and meter readings of produced gas. Compliance will be demonstrated by the 12-month rolling sum of the total rates. Additionally, the flare be designed to operate in compliance with 40 CFR §60.18 specifications.

MRO will conduct the following monitoring procedures on the flare to confirm proper operation:

- Continuous monitoring of the pilot flame using a temperature sensing device, and recording device that will indicate the continuous ignition of the pilot flame at all time when the device is operating;
- Check the recording device is in proper operation once per day;
- Check the auto-ignition system, where applicable, to ensure proper operation once per day;
- Check the pilot flame to ensure proper operation once per day;
- Correct any pilot flame and auto-ignition system failure, when notified by the malfunction alarm as soon as possible, but no longer than five (5) days from the day of the malfunction.

**Item 3**

MRO proposes to operate an emergency flare with a DRE of 98% for VOC emissions. The flare will be manufactured with a manufacturer's guarantee for the 98% DRE. Technical specifications of the device are yet to be determined, but they will comply with 40 CFR §60.18.

**Item 4**

Emission estimates and calculation methodologies are discussed in Section 3 of this application, and detailed emission calculations are provided in Appendix A.

**Item 5**

Emissions of Greenhouse Gases (GHG) are presented in Table 4-1 below, and detailed calculations are provided in Appendix A.

Marathon Oil , LLC  
Maverick Spring Tank Battery  
Emissions Summary

Table 4-1. Greenhouse Gas Emission Rates

Emission Source	EPN	CO <sub>2</sub>		CH <sub>4</sub>		N <sub>2</sub> O	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Process Flare	FL-1	66.52	291.34	0.02	0.08	1.24E-04	5.43E-04
Crude Oil Overflow Tank	CTK-1	0.58	0.49	1.25	0.70	--	--
Crude Oil Reject Tank	CTK-2	1.01E-03	4.42E-03	1.58E-03	0.01	--	--
Crude Oil Steamer Tank	CTK-3	0.01	0.02	0.01	0.03	--	--
Crude Oil Slop Oil Tank	CTK-4	0.01	0.02	0.01	0.03	--	--
Produced Water Skim Tank #1	WTK-1	1.04	2.37	2.55	7.37	--	--
Produced Water Skim Tank #2	WTK-2	1.04	2.37	2.55	7.37	--	--
Produced Water Skim Tank #3	WTK-3	1.04	2.37	2.55	7.37	--	--
Heater Treater #1	HT-1	47.69	208.89	9.14E-04	4.00E-03	8.74E-04	3.83E-03
Heater Treater #2	HT-2	47.69	208.89	9.14E-04	4.00E-03	8.74E-04	3.83E-03
Tank Degassing	MSS-DEGAS	16.20	0.01	6.10	3.05E-03	--	--
<b>TOTAL EMISSIONS:</b>		<b>181.81</b>	<b>716.80</b>	<b>15.04</b>	<b>22.99</b>	<b>1.87E-03</b>	<b>0.01</b>

Marathon Oil , LLC  
Maverick Spring Tank Battery  
Emissions Summary

Table 4-1. Greenhouse Gas Emission Rates

Emission Source	EPN	CO <sub>2</sub>		CH <sub>4</sub>		N <sub>2</sub> O		CO <sub>2</sub> e	
		lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Process Flare	FL-1	66.52	291.34	0.02	0.08	1.24E-04	5.43E-04	67.02	293.53
Crude Oil Overflow Tank	CTK-1	0.58	0.49	1.25	0.70	--	--	31.77	18.07
Crude Oil Reject Tank	CTK-2	1.01E-03	4.42E-03	1.58E-03	0.01	--	--	0.04	0.18
Crude Oil Steamer Tank	CTK-3	0.01	0.02	0.01	0.03	--	--	0.20	0.89
Crude Oil Slop Oil Tank	CTK-4	0.01	0.02	0.01	0.03	--	--	0.20	0.89
Produced Water Skim Tank #1	WTK-1	1.04	2.37	2.55	7.37	--	--	64.88	186.69
Produced Water Skim Tank #2	WTK-2	1.04	2.37	2.55	7.37	--	--	64.88	186.69
Produced Water Skim Tank #3	WTK-3	1.04	2.37	2.55	7.37	--	--	64.88	186.69
Heater Treater #1	HT-1	47.69	208.89	9.14E-04	4.00E-03	8.74E-04	3.83E-03	47.98	210.14
Heater Treater #2	HT-2	47.69	208.89	9.14E-04	4.00E-03	8.74E-04	3.83E-03	47.98	210.14
Tank Degassing	MSS-DEGAS	16.20	0.01	6.10	3.05E-03	--	--	168.61	0.08
<b>TOTAL EMISSIONS:</b>		<b>181.81</b>	<b>716.80</b>	<b>15.04</b>	<b>22.99</b>	<b>1.87E-03</b>	<b>0.01</b>	<b>558.44</b>	<b>1,293.97</b>

Table 4-2. Federal Standard Applicability

Federal Standard	Name	Applicability
<b>NSPS</b>		
NSPS OOOO	Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution	<p>This subpart applies to each storage vessel affected facility, which is a single storage vessel located in the oil and natural gas production segment, natural gas processing segment or natural gas transmission and storage segment.</p> <p><i>The storage vessels at the facility were constructed prior to August 23, 2011, therefore do not meet the applicability provisions of 40 CFR §60.5365. NSPS OOOO is not applicable.</i></p>
NSPS Kb	Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984	<p>This subpart applies to storage vessels containing volatile organic liquids with either a capacity greater than 75 m<sup>3</sup> (470 bbl) with a maximum true vapor greater than 76.6 kPa (11.1 psi) or greater than 151 m<sup>3</sup> (950 bbl) with a maximum true vapor pressure greater than 3.5 kPa (0.5 psi).</p> <p><i>The facility is exempt from the requirements of NSPS Kb under exemption §60.110b (d)(4) for vessels with a design capacity less than or equal to 1,589.874 m<sup>3</sup> used for petroleum or condensate stored, processed, or treated prior to custody transfer. NSPS Kb is not applicable.</i></p>

## 4.2 Air Quality Review

The facility will be constructed in Fremont County, Wyoming which is attainment/unclassifiable for all criteria air pollutants. Further, MRO is requesting a synthetic minor source permit to limit the PTE of regulated pollutants below major source threshold levels as specified in 40 CFR §52.21(b)(1). Therefore, major new source is not triggered and the requirements of 40 CFR §49.158 do not specify the need for air quality review. Therefore, preconstruction monitoring or analysis of impacts to NAAQS, PSD increments, or air quality related values (AQRVs) under 40 CFR §52.21(m) is not required, or provided in this application.

## 4.3 NHPA – National Historic Preservation Act

To expedite the processing of this application, Table 4-3 lists the potentially affected cultural resources within Fremont County, Wyoming affected by the proposed facility.

Table 4-3. Potentially Affected Cultural Resources<sup>1</sup>

National Register of Historic Places			
Atlantic City Mercantile	ELS Bridge over Big Wind River	Lookingbill, Helen, Site	T Cross Ranch Rural Historic District
BMU Bridge over Wind River	ELY Wind River Diversion Dam Bridge	Quien Sabe Ranch	Torrey Lake Club/Ranch Historic District
Brooks Lake Lodge	Fort Washakie Historic District	Riverton Railroad Depot	Torrey Lake Petroglyph District
Carpenter Hotel Historic District	Green Mountain Arrow Site (48FR96)	Shoshone-Episcopal Mission	Twin Pines Lodge and Cabin Camp
Castle Gardens Petroglyph Site	Hamilton City	South Pass	Union Pass
CM Ranch and Simpson Lake Cabins	High Rise Village	South Pass City Historic District	US Post Office and Courthouse- Lander Main
Decker, Dean Site (48FR916; 48SW541)	Jackson Park Town Site Addition Brick Row	South Pass City Historic District (Boundary Increase)	Welty's General Store
Delfelder Schoolhouse	King, C. H., Company and First National Bank of Shoshoni	Split rock Prehistoric Site (48FR1484)	Wind River Agency Blockhouse
Diamond A Ranch	Lander Downtown Historic District	St. Michael's Mission	

## 4.4 ESA – Endangered Species Act

To expedite the processing of this application Table 4-4 below lists the potentially affected species within Fremont County, Wyoming affected by the proposed facility.

<sup>1</sup> <http://nhrp.focus.nps.gov/natreghome.do?searchtype=natreghome>

Produced Gas: 90% of Total Vapors collected from Heater Treaters

Flare Feed Rates and Composition <sup>a,b</sup>				Flare DRE%	Flare Exhaust Components <sup>c</sup>	Criteria Pollutant Emissions <sup>d</sup>
Component	Pilot (lb/hr)	Produced Gas (lb/hr)	Total (lb/hr)			
Nitrogen	--	1.62	1.62	0%	1.62	NO <sub>x</sub> factor: 0.0641 lb/MMBtu
CO2	--	0.54	0.54	0%	0.54	CO factor: 0.5496 lb/MMBtu
Methane	--	1.85	1.85	99%	0.02	
Ethane	--	0.78	0.78	99%	0.01	PM <sub>10</sub> factor: 7.60 lb/MMscf
Propane	5.81	4.52	10.33	98%	0.21	PM <sub>2.5</sub> factor: 7.60 lb/MMscf
Isobutane	--	2.11	2.11	98%	0.04	
n-Butane	--	5.35	5.35	98%	0.11	NO <sub>x</sub> emissions from flare: 0.04 lb/hr
Isopentane	--	1.76	1.76	98%	0.04	CO emissions from flare: 0.31 lb/hr
n-Pentane	--	2.29	2.29	98%	0.05	SO <sub>2</sub> emissions from flare: 0.24 lb/hr
i-C6	--	0.54	0.54	98%	0.01	PM <sub>10</sub> emissions from flare: 4.20E-03 lb/hr
n-Hexane	--	0.44	0.44	98%	0.01	PM <sub>2.5</sub> emissions from flare: 4.20E-03 lb/hr
Benzene	--	0.03	0.03	98%	6.38E-04	H <sub>2</sub> S emissions from flare: 2.51E-03 lb/hr
Cyclohexane	--	0.04	0.04	98%	7.11E-04	
i-C7	--	0.35	0.35	98%	0.01	
n-Heptane	--	0.01	0.01	98%	2.88E-04	
Toluene	--	0.01	0.01	98%	1.47E-04	
2,2,4-Trimethylpentane	--	2.30E-03	2.30E-03	98%	4.60E-05	
n-Octane	--	0.13	0.13	98%	2.55E-03	
Ethylbenzene	--	6.74E-04	6.74E-04	98%	1.35E-05	
m-Xylene	--	1.02E-03	1.02E-03	98%	2.05E-05	
3-Methyloctane	--	--	--	98%	--	
n-Nonane	--	0.06	0.06	98%	1.25E-03	
H2S	--	0.13	0.13	98%	2.51E-03	
Water	--	0.21	0.21	0%	0.21	CO <sub>2</sub> emissions: 66.52 lb/hr
TEG	--	--	--	98%	--	CH <sub>4</sub> emissions: 0.02 lb/hr
DGA	--	--	--	98%	--	N <sub>2</sub> O emissions <sup>g</sup> : 1.24E-04 lb/hr
C10+	--	8.41E-07	8.41E-07	98%	1.68E-08	CO <sub>2e</sub> emissions: 67.02 lb/hr
<b>Total</b>	<b>5.81</b>	<b>22.76</b>	<b>28.57</b>	--	<b>2.86</b>	
<b>Total VOC</b>	<b>5.81</b>	<b>17.64</b>	<b>23.45</b>	--	<b>0.47</b>	
<b>Total HAP</b>	--	<b>0.48</b>	<b>0.48</b>	--	<b>0.01</b>	
Heat Value of Stream (Btu/scf)	2,516.10	2,174.11	2,242.09			
Molecular Weight	44.10	42.86	--			
SO <sub>2</sub> emissions (lb/hr)	--	0.24	0.24			
Volumetric Flow (scf/hr)	50.00	201.55	251.55			
Heat Release (MMBtu/hr)	0.13	0.44	0.56			

<sup>a</sup> Uncontrolled stream properties determined via ProMax.

<sup>b</sup> Tank emissions determined in ProMax at the maximum daily liquid surface temperature.

<sup>c</sup> Flare Exhaust (lb/hr) = Total Uncontrolled Emissions (lb/hr) x (100-Flare DRE (%)).

<sup>d</sup> Flare CO and NO<sub>x</sub> emission factors from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109 (Draft), Table 4, low Btu, 'other' flare type: PM and PM<sub>2.5</sub> emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO<sub>2</sub> emissions assume 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>e</sup> 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor

<sup>f</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse

<sup>g</sup> 40CFR 98.233 (Subpart W), equation W-40. Mass N<sub>2</sub>O = (10E-3) x scf x HHV x EF

Produced Gas: 90% of Total Vapors collected from Heater Treaters

Flare Feed Rates and Composition <sup>a,b</sup>						Criteria Pollutant Emissions
Component	Pilot (lb/hr)	Produced Gas (lb/hr)	Total (lb/hr)	Flare DRE% (%)	Flare Exhaust Components <sup>c</sup> (lb/hr)	
Nitrogen	--	1.62	1.62	0%	1.62	NO <sub>x</sub> factor:
CO2	--	0.54	0.54	0%	0.54	CO factor:
Methane	--	1.85	1.85	99%	0.02	PM <sub>10</sub> factor: PM <sub>2.5</sub> factor:
Ethane	--	0.78	0.78	99%	0.01	
Propane	5.81	4.52	10.33	98%	0.21	NO <sub>x</sub> emissions from flare:
Isobutane	--	2.11	2.11	98%	0.04	
n-Butane	--	5.35	5.35	98%	0.11	CO emissions from flare:
Isopentane	--	1.76	1.76	98%	0.04	SO <sub>2</sub> emissions from flare:
n-Pentane	--	2.29	2.29	98%	0.05	PM <sub>10</sub> emissions from flare:
i-C6	--	0.54	0.54	98%	0.01	PM <sub>2.5</sub> emissions from flare:
n-Hexane	--	0.44	0.44	98%	0.01	H <sub>2</sub> S emissions from flare:
Benzene	--	0.03	0.03	98%	6.38E-04	GHG Pollutant Emissions
Cyclohexane	--	0.04	0.04	98%	7.11E-04	
i-C7	--	0.35	0.35	98%	0.01	GHG CO <sub>2</sub> Factor <sup>g</sup> : GHG N <sub>2</sub> O Factor <sup>g</sup> :
n-Heptane	--	0.01	0.01	98%	2.88E-04	
Toluene	--	0.01	0.01	98%	1.47E-04	GWP CO <sub>2</sub> Equivalent <sup>h</sup> : GWP CH <sub>4</sub> Equivalent <sup>h</sup> : GWP N <sub>2</sub> O Equivalent <sup>h</sup> :
2,2,4-Trimethylpentane	--	2.30E-03	2.30E-03	98%	4.60E-05	
n-Octane	--	0.13	0.13	98%	2.55E-03	CO <sub>2</sub> emissions: CH <sub>4</sub> emissions: N <sub>2</sub> O emissions <sup>g</sup> : CO <sub>2</sub> e emissions:
Ethylbenzene	--	6.74E-04	6.74E-04	98%	1.35E-05	
m-Xylene	--	1.02E-03	1.02E-03	98%	2.05E-05	CO <sub>2</sub> emissions: CH <sub>4</sub> emissions: N <sub>2</sub> O emissions <sup>g</sup> : CO <sub>2</sub> e emissions:
3-Methyloctane	--	--	--	98%	--	
n-Nonane	--	0.06	0.06	98%	1.25E-03	CO <sub>2</sub> emissions: CH <sub>4</sub> emissions: N <sub>2</sub> O emissions <sup>g</sup> : CO <sub>2</sub> e emissions:
H2S	--	0.13	0.13	98%	2.51E-03	
Water	--	0.21	0.21	0%	0.21	CO <sub>2</sub> emissions: CH <sub>4</sub> emissions: N <sub>2</sub> O emissions <sup>g</sup> : CO <sub>2</sub> e emissions:
TEG	--	--	--	98%	--	
DGA	--	--	--	98%	--	CO <sub>2</sub> emissions: CH <sub>4</sub> emissions: N <sub>2</sub> O emissions <sup>g</sup> : CO <sub>2</sub> e emissions:
C10+	--	8.41E-07	8.41E-07	98%	1.68E-08	
<b>Total</b>	<b>5.81</b>	<b>22.76</b>	<b>28.57</b>	--	<b>2.86</b>	
<b>Total VOC</b>	<b>5.81</b>	<b>17.64</b>	<b>23.45</b>	--	<b>0.47</b>	
<b>Total HAP</b>	<b>--</b>	<b>0.48</b>	<b>0.48</b>	--	<b>0.01</b>	
Heat Value of Stream (Btu/scf)	2,516.10	2,174.11	2,242.09			
Molecular Weight	44.10	42.86	--			
SO <sub>2</sub> emissions (lb/hr)	--	0.24	0.24			
Volumetric Flow (scf/hr)	50.00	201.55	251.55			
Heat Release (MMBtu/hr)	0.13	0.44	0.56			

<sup>a</sup> Uncontrolled stream properties determined via ProMax.  
<sup>b</sup> Tank emissions determined in ProMax at the maximum daily liquid surface temperature.  
<sup>c</sup> Flare Exhaust (lb/hr) = Total Uncontrolled Emissions (lb/hr) x (100-Flare DRE (%)).  
<sup>d</sup> Flare CO and NOx emission factors from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109 (Draft), Table 4, low B PM2.5 emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO2 emissions assume 100% conversion of H2S to SO2.  
<sup>e</sup> 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor  
<sup>f</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse.  
<sup>g</sup> 40CFR 98.233 (Subpart W), equation W-40. Mass N2O = (10E-3) x scf x HHV x EF

Marathon Oil, LLC  
 Maverick Spring Tank Battery  
 FL-1 Hourly

**Sample Calculations**

Flare PM emissions were calculated using the following formula:

$$\text{Emissions} = \text{EF} / \text{CF} * \text{THR}$$

where,

Emissions = Flare emissions (lb/hr)  
 EF = Emission factor (lb/10<sup>6</sup> scf)  
 CF = 1020 (Btu/scf) Conversion factor from scf to Btu  
 THR = Total Heat Release (MMBtu/hr)

NO<sub>x</sub> and CO emissions were calculated using the equation below:

$$\text{Emissions} = \text{EF} * \text{THR}$$

where,

EF = Emission factor (lb/MMBtu)  
 THR = Total Heat Release (MMBtu/hr)

VOC and speciated (HAP) emissions were calculated using the equation below:

$$\text{Emissions} = \text{MR}_i * (100\% - \text{DE}_{\text{VOC}})$$

where,

MR = Mass Rate (lb/hr)  
 DE<sub>VOC</sub> = VOC destruction efficiency (%)

H<sub>2</sub>S emissions were calculated using the equation below:

$$\text{Emissions} = \text{MR}_{\text{H}_2\text{S}} * (100\% - \text{DE}_{\text{H}_2\text{S}})$$

where,

MR<sub>H<sub>2</sub>S</sub> = Mass Rate of H<sub>2</sub>S (lb/hr)  
 DE<sub>H<sub>2</sub>S</sub> = H<sub>2</sub>S destruction efficiency (%)

SO<sub>2</sub> emissions were calculated assuming 100% of the H<sub>2</sub>S was converted to SO<sub>2</sub>, as shown in the equation below:

$$\text{Emissions} = \text{MR}_{\text{H}_2\text{S}} * \text{MW}_{\text{SO}_2} / \text{MW}_{\text{H}_2\text{S}}$$

where,

MR<sub>H<sub>2</sub>S</sub> = Mass Rate of H<sub>2</sub>S (lb/hr)  
 MW<sub>SO<sub>2</sub></sub> = Molecular weight of SO<sub>2</sub> (lb/lbmole)  
 MW<sub>H<sub>2</sub>S</sub> = Molecular weight of H<sub>2</sub>S (lb/lbmole)

Produced Gas: 90% of Total Vapors collected from Heater Treaters

Flare Feed Rates and Composition <sup>a,b</sup>				Flare DRE%	Flare Exhaust Components <sup>c</sup>	Criteria Pollutant Emissions <sup>d</sup>
Component	Pilot	Produced Gas	Total			
	(ton/year)	(ton/year)	(ton/year)	(%)	(ton/year)	
Nitrogen	--	7.09	7.09	0%	7.09	NO <sub>x</sub> factor 0.0641 lb/MMBtu
CO <sub>2</sub>	--	2.37	2.37	0%	2.37	CO factor 0.5496 lb/MMBtu
Methane	--	8.11	8.11	99%	0.08	
Ethane	--	3.41	3.41	99%	0.03	PM <sub>10</sub> factor 7.60 lb/MMscf
Propane	25.45	19.82	45.27	98%	0.91	PM <sub>2.5</sub> factor 7.60 lb/MMscf
Isobutane	--	9.26	9.26	98%	0.19	
n-Butane	--	23.44	23.44	98%	0.47	NO <sub>x</sub> emissions from flare: 0.16 ton/yr
Isopentane	--	7.70	7.70	98%	0.15	CO emissions from flare: 1.36 ton/yr
n-Pentane	--	10.01	10.01	98%	0.20	SO <sub>2</sub> emissions from flare: 1.03 ton/yr
i-C6	--	2.35	2.35	98%	0.05	PM <sub>10</sub> emissions from flare: 0.02 ton/yr
n-Hexane	--	1.93	1.93	98%	0.04	PM <sub>2.5</sub> emissions from flare: 0.02 ton/yr
Benzene	--	0.14	0.14	98%	2.79E-03	H <sub>2</sub> S emissions from flare: 0.01 ton/yr
Cyclohexane	--	0.16	0.16	98%	3.11E-03	
i-C7	--	1.53	1.53	98%	0.03	
n-Heptane	--	0.06	0.06	98%	1.26E-03	
Toluene	--	0.03	0.03	98%	6.42E-04	
2,2,4-Trimethylpentane	--	0.01	0.01	98%	2.01E-04	
n-Octane	--	0.56	0.56	98%	0.01	GHG CO <sub>2</sub> Factor <sup>e</sup> : 116.98 lb/MMBTU
Ethylbenzene	--	2.95E-03	2.95E-03	98%	5.91E-05	GHG N <sub>2</sub> O Factor <sup>e</sup> : 2.20E-04 lb/MMBTU
m-Xylene	--	4.48E-03	4.48E-03	98%	8.97E-05	
3-Methyloctane	--	--	--	98%	--	GWP CO <sub>2</sub> Equivalent <sup>f</sup> : 1
n-Nonane	--	0.27	0.27	98%	0.01	GWP CH <sub>4</sub> Equivalent <sup>f</sup> : 25
H <sub>2</sub> S	--	0.55	0.55	98%	0.01	GWP N <sub>2</sub> O Equivalent <sup>f</sup> : 298.00
Water	--	0.91	0.91	0%	0.91	CO <sub>2</sub> emissions: 291.34 tpy
TEG	--	--	--	98%	--	CH <sub>4</sub> emissions: 0.08 tpy
DGA	--	--	--	98%	--	N <sub>2</sub> O emissions <sup>g</sup> : 5.43E-04 tpy
C10+	--	3.68E-06	3.68E-06	98%	7.37E-08	CO <sub>2</sub> e emissions: 293.53 tpy
<b>Total</b>	<b>25.45</b>	<b>99.70</b>	<b>125.15</b>	--	<b>12.54</b>	
<b>Total VOC</b>	<b>25.45</b>	<b>77.28</b>	<b>102.73</b>	--	<b>2.05</b>	
<b>Total HAP</b>	--	<b>2.12</b>	<b>2.12</b>	--	<b>0.04</b>	
Heat Value of Stream (Btu/scf)	2,516.10	2,174.11	2,242.09			
Molecular Weight	44.10	42.96	--			
SO <sub>2</sub> emissions (tpy)	--	1.03	1.03			
Volumetric Flow (scf/yr)	438,000.00	1,765,618.60	2,203,618.60			
Total heat release (MMBtu/yr)	1,102.05	3,838.65	4,940.70			

<sup>a</sup> Uncontrolled stream properties determined via ProMax.

<sup>b</sup> Tank emissions determined in ProMax. Annual flash emissions are calculated at the average daily liquid surface temperature.

<sup>c</sup> Flare Exhaust (tpy) = Total Uncontrolled Emissions (tpy) x (100-Flare DRE (%))

<sup>d</sup> Flare CO and NO<sub>x</sub> emission factors from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109 (Draft), Table 4, low Btu, 'other' flare type. PM and PM<sub>2.5</sub> emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO<sub>2</sub> emissions assume 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>e</sup> 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu) \* (2.20462 lb/kg)

<sup>f</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

<sup>g</sup> 40CFR 98.233 (Subpart W), equation W-40. Mass N<sub>2</sub>O = (10E-3) x scf x HHV x EF

Produced Gas: 90% of Total Vapors collected from Heater Treaters

Flare Feed Rates and Composition <sup>a,b</sup>				Flare DRE%	Flare Exhaust Components <sup>c</sup>	Criteria Pollutant E
Component	Pilot	Produced Gas	Total			
	(ton/year)	(ton/year)	(ton/year)	(%)	(ton/year)	
Nitrogen	--	7.09	7.09	0%	7.09	NO <sub>x</sub> factor:
CO2	--	2.37	2.37	0%	2.37	CO factor:
Methane	--	8.11	8.11	99%	0.08	PM <sub>10</sub> factor:
Ethane	--	3.41	3.41	99%	0.03	
Propane	25.45	19.82	45.27	98%	0.91	PM <sub>2.5</sub> factor:
Isobutane	--	9.26	9.26	98%	0.19	NO <sub>x</sub> emissions from flare:
n-Butane	--	23.44	23.44	98%	0.47	
Isopentane	--	7.70	7.70	98%	0.15	CO emissions from flare:
n-Pentane	--	10.01	10.01	98%	0.20	SO <sub>2</sub> emissions from flare:
i-C6	--	2.35	2.35	98%	0.05	PM <sub>10</sub> emissions from flare:
n-Hexane	--	1.93	1.93	98%	0.04	PM <sub>2.5</sub> emissions from flare:
Benzene	--	0.14	0.14	98%	2.79E-03	H <sub>2</sub> S emissions from flare:
Cyclohexane	--	0.16	0.16	98%	3.11E-03	GHG Pollutant Em
i-C7	--	1.53	1.53	98%	0.03	
n-Heptane	--	0.06	0.06	98%	1.26E-03	GHG CO <sub>2</sub> Factor <sup>d</sup> :
Toluene	--	0.03	0.03	98%	6.42E-04	
2,2,4-Trimethylpentane	--	0.01	0.01	98%	2.01E-04	GHG N <sub>2</sub> O Factor <sup>e</sup> :
n-Octane	--	0.56	0.56	98%	0.01	GWP CO <sub>2</sub> Equivalent <sup>f</sup> :
Ethylbenzene	--	2.95E-03	2.95E-03	98%	5.91E-05	
m-Xylene	--	4.48E-03	4.48E-03	98%	8.97E-05	GWP CH <sub>4</sub> Equivalent <sup>f</sup> :
3-Methyloctane	--	--	--	98%	--	GWP N <sub>2</sub> O Equivalent <sup>f</sup> :
n-Nonane	--	0.27	0.27	98%	0.01	CO <sub>2</sub> emissions:
H2S	--	0.55	0.55	98%	0.01	
Water	--	0.91	0.91	0%	0.91	CH <sub>4</sub> emissions:
TEG	--	--	--	98%	--	N <sub>2</sub> O emissions <sup>g</sup> :
DGA	--	--	--	98%	--	CO <sub>2</sub> e emissions:
C10+	--	3.68E-06	3.68E-06	98%	7.37E-08	
<b>Total</b>	<b>25.45</b>	<b>99.70</b>	<b>125.15</b>	--	<b>12.54</b>	
<b>Total VOC</b>	<b>25.45</b>	<b>77.28</b>	<b>102.73</b>	--	<b>2.05</b>	
<b>Total HAP</b>	--	<b>2.12</b>	<b>2.12</b>	--	<b>0.04</b>	
Heat Value of Stream (Btu/scf)	2,516.10	2,174.11	2,242.09			
Molecular Weight	44.10	42.86	--			
SO <sub>2</sub> emissions (tpy)	--	1.03	1.03			
Volumetric Flow (scf/yr)	438,000.00	1,765,618.60	2,203,618.60			
Total heat release (MMBtu/yr)	1,102.05	3,838.65	4,940.70			

<sup>a</sup> Uncontrolled stream properties determined via ProMax.

<sup>b</sup> Tank emissions determined in ProMax. Annual flash emissions are calculated at the average daily liquid surface temperature.

<sup>c</sup> Flare Exhaust (tpy) = Total Uncontrolled Emissions (tpy) x (100-Flare DRE (%))

<sup>d</sup> Flare CO and NO<sub>x</sub> emission factors from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109 (Draft), Table 4, low Btu, other emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO<sub>2</sub> emissions assume 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>e</sup> 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu) \* (2.20462 lb/kg)

<sup>f</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

<sup>g</sup> 40CFR 98.233 (Subpart W), equation W-40. Mass N<sub>2</sub>O = (10E-3) x scf x HHV x EF

Produced Gas: 100% of Total Vapors collected from Heater Treaters

Flare Feed Rates and Composition <sup>a,b</sup>						Criteria Pollutant Emissions
Component	Pilot (lb/hr)	Produced Gas (lb/hr)	Total (lb/hr)	Flare DRE% (%)	Flare Exhaust Components <sup>c</sup> (lb/hr)	
Nitrogen	--	1.80	1.80	0%	1.80	NO <sub>x</sub> factor:
CO <sub>2</sub>	--	0.60	0.60	0%	0.60	CO factor:
Methane	--	2.06	2.06	0%	2.06	PM <sub>10</sub> factor: PM <sub>2.5</sub> factor:
Ethane	--	0.86	0.86	0%	0.86	
Propane	--	5.03	5.03	0%	5.03	NO <sub>x</sub> emissions from flare: CO emissions from flare: SO <sub>2</sub> emissions from flare:
Isobutane	--	2.35	2.35	0%	2.35	
n-Butane	--	5.95	5.95	0%	5.95	PM <sub>10</sub> emissions from flare: PM <sub>2.5</sub> emissions from flare: H <sub>2</sub> S emissions from flare:
Isopentane	--	1.95	1.95	0%	1.95	
n-Pentane	--	2.54	2.54	0%	2.54	GHG Pollutant Emissions
i-C6	--	0.60	0.60	0%	0.60	
n-Hexane	--	0.49	0.49	0%	0.49	GHG CO <sub>2</sub> Factor <sup>d</sup> : GHG N <sub>2</sub> O Factor <sup>e</sup> :
Benzene	--	0.04	0.04	0%	0.04	
Cyclohexane	--	0.04	0.04	0%	0.04	GWP CO <sub>2</sub> Equivalent <sup>f</sup> : GWP CH <sub>4</sub> Equivalent <sup>f</sup> : GWP N <sub>2</sub> O Equivalent <sup>f</sup> :
i-C7	--	0.39	0.39	0%	0.39	
n-Heptane	--	0.02	0.02	0%	0.02	CO <sub>2</sub> emissions: CH <sub>4</sub> emissions: N <sub>2</sub> O emissions <sup>g</sup> : CO <sub>2</sub> e emissions:
Toluene	--	0.01	0.01	0%	0.01	
2,2,4-Trimethylpentane	--	2.55E-03	2.55E-03	0%	2.55E-03	Total VOC
n-Octane	--	0.14	0.14	0%	0.14	
Ethylbenzene	--	7.49E-04	7.49E-04	0%	7.49E-04	Total HAP
m-Xylene	--	1.14E-03	1.14E-03	0%	1.14E-03	
3-Methyloctane	--	--	--	0%	--	Heat Value of Stream (Btu/scf)
n-Nonane	--	0.07	0.07	0%	0.07	
H <sub>2</sub> S	--	0.14	0.14	0%	0.14	Molecular Weight
Water	--	0.23	0.23	0%	0.23	
TEG	--	--	--	0%	--	SO <sub>2</sub> emissions (lb/hr)
DGA	--	--	--	0%	--	
C10+	--	9.35E-07	9.35E-07	0%	9.35E-07	Volumetric Flow (scf/hr)
<b>Total</b>	--	<b>25.29</b>	<b>25.29</b>	--	<b>25.29</b>	
<b>Total VOC</b>	--	<b>19.60</b>	<b>19.60</b>	--	<b>19.60</b>	Heat Release (MMBtu/hr)
<b>Total HAP</b>	--	<b>0.54</b>	<b>0.54</b>	--	<b>0.54</b>	
Heat Value of Stream (Btu/scf)	2,516.10	2,174.11	--			
Molecular Weight	44.10	42.86	--			
SO <sub>2</sub> emissions (lb/hr)	--	0.26	0.26			
Volumetric Flow (scf/hr)	--	223.95	223.95			
Heat Release (MMBtu/hr)	--	0.49	0.49			

<sup>a</sup> Uncontrolled stream properties determined via ProMax.

<sup>b</sup> Tank emissions determined in ProMax at the maximum daily liquid surface temperature.

<sup>c</sup> Flare Exhaust (lb/hr) = Total Uncontrolled Emissions (lb/hr).

<sup>d</sup> Flare CO and NO<sub>x</sub> emission factors from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109 (Draft), Table 4, low B PM<sub>2.5</sub> emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO<sub>2</sub> emissions assume 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>e</sup> 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu) \* (2.20462 lb/kg)

<sup>f</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

<sup>g</sup> 40CFR 98.233 (Subpart W), equation W-40. Mass N<sub>2</sub>O = (10E-3) x scf x HHV x EF

Produced Gas: 100% of Total Vapors collected from Heater Treaters

Flare Feed Rates and Composition <sup>a,b</sup>				Flare DRE%	Flare Exhaust Components <sup>c</sup>	Criteria Pollutant Emissions <sup>d</sup>	
Component	Pilot (lb/hr)	Produced Gas (lb/hr)	Total (lb/hr)				
Nitrogen	--	1.80	1.80	0%	1.80	NO <sub>x</sub> factor:	0.0641 lb/MMBtu
CO <sub>2</sub>	--	0.60	0.60	0%	0.60	CO factor:	0.5496 lb/MMBtu
Methane	--	2.06	2.06	0%	2.06	PM <sub>10</sub> factor:	7.60 lb/MMscf
Ethane	--	0.86	0.86	0%	0.86	PM <sub>2.5</sub> factor:	7.60 lb/MMscf
Propane	--	5.03	5.03	0%	5.03		
Isobutane	--	2.35	2.35	0%	2.35		
n-Butane	--	5.95	5.95	0%	5.95	NO <sub>x</sub> emissions from flare:	0.03 lb/hr
Isopentane	--	1.95	1.95	0%	1.95	CO emissions from flare:	0.27 lb/hr
n-Pentane	--	2.54	2.54	0%	2.54	SO <sub>2</sub> emissions from flare:	0.26 lb/hr
i-C6	--	0.60	0.60	0%	0.60	PM <sub>10</sub> emissions from flare:	3.63E-03 lb/hr
n-Hexane	--	0.49	0.49	0%	0.49	PM <sub>2.5</sub> emissions from flare:	3.63E-03 lb/hr
Benzene	--	0.04	0.04	0%	0.04	H <sub>2</sub> S emissions from flare:	0.14 lb/hr
Cyclohexane	--	0.04	0.04	0%	0.04		
i-C7	--	0.39	0.39	0%	0.39	<b>GHG Pollutant Emissions</b>	
n-Heptane	--	0.02	0.02	0%	0.02		
Toluene	--	0.01	0.01	0%	0.01	GHG CO <sub>2</sub> Factor <sup>e</sup> :	116.98 lb/MMBTU
2,2,4-Trimethylpentane	--	2.55E-03	2.55E-03	0%	2.55E-03	GHG N <sub>2</sub> O Factor <sup>e</sup> :	2.20E-04 lb/MMBTU
n-Octane	--	0.14	0.14	0%	0.14	GWP CO <sub>2</sub> Equivalent <sup>f</sup> :	1
Ethylbenzene	--	7.49E-04	7.49E-04	0%	7.49E-04	GWP CH <sub>4</sub> Equivalent <sup>f</sup> :	25
m-Xylene	--	1.14E-03	1.14E-03	0%	1.14E-03	GWP N <sub>2</sub> O Equivalent <sup>f</sup> :	298
3-Methyloctane	--	--	--	0%	--		
n-Nonane	--	0.07	0.07	0%	0.07		
H <sub>2</sub> S	--	0.14	0.14	0%	0.14	CO <sub>2</sub> emissions:	57.56 lb/hr
Water	--	0.23	0.23	0%	0.23	CH <sub>4</sub> emissions:	2.06 lb/hr
TEG	--	--	--	0%	--	N <sub>2</sub> O emissions <sup>g</sup> :	1.07E-04 lb/hr
DGA	--	--	--	0%	--	CO <sub>2</sub> e emissions:	109.01 lb/hr
C10+	--	9.35E-07	9.35E-07	0%	9.35E-07		
<b>Total</b>	--	<b>25.29</b>	<b>25.29</b>	--	<b>25.29</b>		
<b>Total VOC</b>	--	<b>19.60</b>	<b>19.60</b>	--	<b>19.60</b>		
<b>Total HAP</b>	--	<b>0.54</b>	<b>0.54</b>	--	<b>0.54</b>		
Heat Value of Stream (Btu/scf)	2,516.10	2,174.11	--				
Molecular Weight	44.10	42.86	--				
SO <sub>2</sub> emissions (lb/hr)	--	0.26	0.26				
Volumetric Flow (scf/hr)	--	223.95	223.95				
Heat Release (MMBtu/hr)	--	0.49	0.49				

<sup>a</sup> Uncontrolled stream properties determined via ProMax.

<sup>b</sup> Tank emissions determined in ProMax at the maximum daily liquid surface temperature.

<sup>c</sup> Flare Exhaust (lb/hr) = Total Uncontrolled Emissions (lb/hr).

<sup>d</sup> Flare CO and NO<sub>x</sub> emission factors from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109 (Draft), Table 4, low Btu, 'other' flare type. PM and PM<sub>2.5</sub> emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO<sub>2</sub> emissions assume 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>e</sup> 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu) \* (2.20462 lb/kg)

<sup>f</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

<sup>g</sup> 40CFR 98.233 (Subpart W), equation W-40. Mass N<sub>2</sub>O = (10E-3) x scf x HHV x EF

**Sample Calculations**

Flare PM emissions were calculated using the following formula:

$$\text{Emissions} = \text{EF} / \text{CF} * \text{THR}$$

where,

- Emissions = Flare emissions (lb/hr)
- EF = Emission factor (lb/10<sup>6</sup> scf)
- CF = 1020 (Btu/scf) Conversion factor from scf to Btu
- THR = Total Heat Release (MMBtu/hr)

NO<sub>x</sub> and CO emissions were calculated using the equation below:

$$\text{Emissions} = \text{EF} * \text{THR}$$

where,

- EF = Emission factor (lb/MMBtu)
- THR = Total Heat Release (MMBtu/hr)

VOC and speciated (HAP) emissions were calculated using the equation below:

$$\text{Emissions} = \text{MR} * (100\% - \text{DE}_{\text{VOC}})$$

where,

- MR = Mass Rate (lb/hr)
- DE<sub>VOC</sub> = VOC destruction efficiency (%)

H<sub>2</sub>S emissions were calculated using the equation below:

$$\text{Emissions} = \text{MR}_{\text{H}_2\text{S}} * (100\% - \text{DE}_{\text{H}_2\text{S}})$$

where,

- MR<sub>H<sub>2</sub>S</sub> = Mass Rate of H<sub>2</sub>S (lb/hr)
- DE<sub>H<sub>2</sub>S</sub> = H<sub>2</sub>S destruction efficiency (%)

SO<sub>2</sub> emissions were calculated assuming 100% of the H<sub>2</sub>S was converted to SO<sub>2</sub>, as shown in the equation below:

$$\text{Emissions} = \text{MR}_{\text{H}_2\text{S}} * \text{MW}_{\text{SO}_2} / \text{MW}_{\text{H}_2\text{S}}$$

where,

- MR<sub>H<sub>2</sub>S</sub> = Mass Rate of H<sub>2</sub>S (lb/hr)
- MW<sub>SO<sub>2</sub></sub> = Molecular weight of SO<sub>2</sub> (lb/lbmole)
- MW<sub>H<sub>2</sub>S</sub> = Molecular weight of H<sub>2</sub>S (lb/lbmole)

Produced Gas: 100% of Total Vapors collected from Heater Treaters

Flare Feed Rates and Composition <sup>a,b</sup>				Flare DRE%	Flare Exhaust Components <sup>c</sup>	Criteria Pollutant E
Component	Pilot (ton/year)	Produced Gas (ton/year)	Total (ton/year)			
Nitrogen	--	7.88	7.88	0%	7.88	NO <sub>x</sub> factor:
CO <sub>2</sub>	--	2.63	2.63	0%	2.63	CO factor:
Methane	--	9.01	9.01	0%	9.01	
Ethane	--	3.79	3.79	0%	3.79	PM <sub>10</sub> factor:
Propane	--	22.02	22.02	0%	22.02	PM <sub>2.5</sub> factor:
Isobutane	--	10.28	10.28	0%	10.28	
n-Butane	--	26.04	26.04	0%	26.04	NO <sub>x</sub> emissions from flare:
Isopentane	--	8.56	8.56	0%	8.56	CO emissions from flare:
n-Pentane	--	11.12	11.12	0%	11.12	SO <sub>2</sub> emissions from flare:
i-C6	--	2.61	2.61	0%	2.61	PM <sub>10</sub> emissions from flare:
n-Hexane	--	2.15	2.15	0%	2.15	PM <sub>2.5</sub> emissions from flare:
Benzene	--	0.16	0.16	0%	0.16	H <sub>2</sub> S emissions from flare:
Cyclohexane	--	0.17	0.17	0%	0.17	
i-C7	--	1.70	1.70	0%	1.70	<b>GHG Pollutant Em</b>
n-Heptane	--	0.07	0.07	0%	0.07	
Toluene	--	0.04	0.04	0%	0.04	
2,2,4-Trimethylpentane	--	0.01	0.01	0%	0.01	GHG CO <sub>2</sub> Factor <sup>a</sup> :
n-Octane	--	0.62	0.62	0%	0.62	GHG N <sub>2</sub> O Factor <sup>a</sup> :
Ethylbenzene	--	3.28E-03	3.28E-03	0%	3.28E-03	GWP CO <sub>2</sub> Equivalent <sup>d</sup> :
m-Xylene	--	4.98E-03	4.98E-03	0%	4.98E-03	GWP CH <sub>4</sub> Equivalent <sup>d</sup> :
3-Methyloctane	--	--	--	0%	--	GWP N <sub>2</sub> O Equivalent <sup>d</sup> :
n-Nonane	--	0.30	0.30	0%	0.30	
H <sub>2</sub> S	--	0.61	0.61	0%	0.61	CO <sub>2</sub> emissions:
Water	--	1.01	1.01	0%	1.01	CH <sub>4</sub> emissions:
TEG	--	--	--	0%	--	N <sub>2</sub> O emissions <sup>e</sup> :
DGA	--	--	--	0%	--	CO <sub>2</sub> e emissions:
C10+	--	4.09E-06	4.09E-06	0%	4.09E-06	
<b>Total</b>	--	<b>110.78</b>	<b>110.78</b>	--	<b>110.78</b>	
<b>Total VOC</b>	--	<b>85.86</b>	<b>85.86</b>	--	<b>85.86</b>	
<b>Total HAP</b>	--	<b>2.36</b>	<b>2.36</b>	--	<b>2.36</b>	
Heat Value of Stream (Btu/scf)	2,516.10	2,174.11	--			
Molecular Weight	44.10	42.86	--			
SO <sub>2</sub> emissions (tpy)	--	1.15	--			
Volumetric Flow (scf/yr)	--	1,961,798.45	<b>1,961,798.45</b>			
Total heat release (MMBtu/yr)	--	4,265.17	<b>4,265.17</b>			

<sup>a</sup> Uncontrolled stream properties determined via ProMax.

<sup>b</sup> Tank emissions determined in ProMax. Annual flash emissions are calculated at the average daily liquid surface temperature.

<sup>c</sup> Flare Exhaust (tpy) = Total Uncontrolled Emissions (tpy).

<sup>d</sup> Flare CO and NO<sub>x</sub> emission factors from TCEQ Air Permit Technical Guidance for Chemical Sources, Flares and Vapor Oxidizers, October 2000 RG-109 (Draft), Table 4, low Btu, other emission factors from AP-42, Table 1.4-1 and 1.4-2, July 1998. SO<sub>2</sub> emissions assume 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>e</sup> 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu)

<sup>f</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas

<sup>g</sup> 40CFR 98.233 (Subpart W), equation W-40. Mass N<sub>2</sub>O = (10E-3) x scf x HHV x EF

Produced Gas: 100% of Total Vapors collected from Heater Treaters

Flare Feed Rates and Composition <sup>a,b</sup>				Flare DRE%	Flare Exhaust Components <sup>c</sup>	Criteria Pollutant Emissions <sup>d</sup>
Component	Pilot	Produced Gas	Total			
	(ton/year)	(ton/year)	(ton/year)	(%)	(ton/year)	
Nitrogen	--	7.88	7.88	0%	7.88	NO <sub>x</sub> factor: 0.0641 lb/MMBtu
CO2	--	2.63	2.63	0%	2.63	CO factor: 0.5496 lb/MMBtu
Methane	--	9.01	9.01	0%	9.01	
Ethane	--	3.79	3.79	0%	3.79	PM <sub>10</sub> factor: 7.60 lb/MMscf
Propane	--	22.02	22.02	0%	22.02	PM <sub>2.5</sub> factor: 7.60 lb/MMscf
Isobutane	--	10.28	10.28	0%	10.28	
n-Butane	--	26.04	26.04	0%	26.04	NO <sub>x</sub> emissions from flare: 0.14 ton/yr
Isopentane	--	8.56	8.56	0%	8.56	CO emissions from flare: 1.17 ton/yr
n-Pentane	--	11.12	11.12	0%	11.12	SO <sub>2</sub> emissions from flare: -- ton/yr
i-C6	--	2.61	2.61	0%	2.61	PM <sub>10</sub> emissions from flare: -- ton/yr
n-Hexane	--	2.15	2.15	0%	2.15	PM <sub>2.5</sub> emissions from flare: -- ton/yr
Benzene	--	0.16	0.16	0%	0.16	H <sub>2</sub> S emissions from flare: 0.61 ton/yr
Cyclohexane	--	0.17	0.17	0%	0.17	
i-C7	--	1.70	1.70	0%	1.70	
n-Heptane	--	0.07	0.07	0%	0.07	
Toluene	--	0.04	0.04	0%	0.04	
2,2,4-Trimethylpentane	--	0.01	0.01	0%	0.01	
n-Octane	--	0.62	0.62	0%	0.62	GHG CO <sub>2</sub> Factor <sup>e</sup> : 116.98 lb/MMBTU
Ethylbenzene	--	3.28E-03	3.28E-03	0%	3.28E-03	GHG N <sub>2</sub> O Factor <sup>f</sup> : 2.20E-04 lb/MMBTU
m-Xylene	--	4.98E-03	4.98E-03	0%	4.98E-03	GWP CO <sub>2</sub> Equivalent <sup>g</sup> : 1
3-Methyloctane	--	--	--	0%	--	GWP CH <sub>4</sub> Equivalent <sup>g</sup> : 25
n-Nonane	--	0.30	0.30	0%	0.30	GWP N <sub>2</sub> O Equivalent <sup>g</sup> : 298.00
H2S	--	0.61	0.61	0%	0.61	
Water	--	1.01	1.01	0%	1.01	CO <sub>2</sub> emissions: 252.09 tpy
TEG	--	--	--	0%	--	CH <sub>4</sub> emissions: 9.01 tpy
DGA	--	--	--	0%	--	N <sub>2</sub> O emissions <sup>h</sup> : 4.69E-04 tpy
C10+	--	4.09E-06	4.09E-06	0%	4.09E-06	CO <sub>2</sub> e emissions: 477.46 tpy
<b>Total</b>	--	<b>110.78</b>	<b>110.78</b>	--	<b>110.78</b>	
<b>Total VOC</b>	--	<b>85.86</b>	<b>85.86</b>	--	<b>85.86</b>	
<b>Total HAP</b>	--	<b>2.36</b>	<b>2.36</b>	--	<b>2.36</b>	
Heat Value of Stream (Btu/scf)	2,516.10	2,174.11	--			
Molecular Weight	44.10	42.86	--			
SO <sub>2</sub> emissions (tpy)	--	1.15	--			
Volumetric Flow (scf/yr)	--	1,961,798.45	<b>1,961,798.45</b>			
Total heat release (MMBtu/yr)	--	4,265.17	<b>4,265.17</b>			

<sup>a</sup> Uncontrolled stream properties determined via ProMax

<sup>b</sup> Tank emissions determined in ProMax. Annual flash emissions are calculated at the average daily liquid surface temperature

<sup>c</sup> Flare Exhaust (tpy) = Total Uncontrolled Emissions (tpy).

<sup>d</sup> Flare CO and NO<sub>x</sub> emission factors from TCEQ Air Permit Technical Guidance for Chemical Sources: Flares and Vapor Oxidizers, October 2000 RG-109 (Draft), Table 4, low Btu, "other" flare type. PM and PM<sub>2.5</sub> emission factors from AP-42, Table 1.4-1 and 1.4-2. July 1998. SO<sub>2</sub> emissions assume 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>e</sup> 40 CFR 98 Subpart C, Table C-1 and C-2. Emission Factor (lb/MMBtu) = Emission factor (kg/MMBtu)

<sup>f</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas

<sup>g</sup> 40CFR 98.233 (Subpart W), equation W-40. Mass N<sub>2</sub>O = (10E-3) x scf x HHV x EF

Marathon Oil , LLC  
 Maverick Spring Tank Battery  
 Produced Water Skimmer Tanks

Identification - Vertical Fixed Roof Tanks		
Emission Source	Crude Oil Sales Tank- 300 BBL	
Throughput (BPD)	1,800.00	
Throughput (BPY)	657,000	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	2,415.75	
Net Throughput (gal/yr)	27,594,000	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	6.78	
Water		
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>d</sup>	12.24	

Notes  
<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report.

Speciated Crude Oil Sales Tank Emissions -CTK-1

Component	Crude Oil Sales Tank- 300 BBL			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	0.03	0.47	0.15	--
CO2	0.11	0.47	0.49	--
Methane	0.16	1.09	0.70	--
Ethane	0.24	0.91	1.06	--
Propane	0.93	6.27	4.09	--
Isobutane	0.35	2.99	1.55	--
n-Butane	0.84	7.55	3.68	--
Isopentane	0.24	2.41	1.05	--
n-Pentane	0.29	3.09	1.27	--
i-C6	0.06	0.70	0.26	--
n-Hexane	0.05	0.56	0.21	--
Benzene	2.59E-03	0.04	0.01	--
Cyclohexane	3.86E-03	0.04	0.02	--
i-C7	0.01	0.43	0.04	--
n-Heptane	1.25E-03	0.02	0.01	--
Toluene	5.26E-04	0.01	2.30E-03	--
2,2,4-Trimethylpentane	2.26E-04	2.77E-03	9.88E-04	--
n-Octane	0.01	0.14	0.04	--
Ethylbenzene	4.42E-05	7.57E-04	1.93E-04	--
m-Xylene	8.88E-05	1.15E-03	3.88E-04	--
3-Methyloctane	--	--	--	--
n-Nonane	3.67E-03	0.07	0.02	--
H2S	0.04	0.17	0.16	--
Water	4.06E-05	0.26	1.78E-04	--
TEG	--	--	--	--
DGA	1.98E-09	3.55E-07	8.66E-09	--
C10+	1.98E-09	3.55E-07	8.66E-09	--
<b>Total</b>	<b>3.38</b>	<b>27.94</b>	<b>15.10</b>	<b>--</b>
<b>Total CO2</b>	<b>0.11</b>	<b>0.47</b>	<b>0.49</b>	<b>--</b>
<b>Total Methane</b>	<b>0.16</b>	<b>1.09</b>	<b>0.70</b>	<b>--</b>
<b>Total CO<sub>2</sub>e</b>	<b>4.13</b>	<b>27.64</b>	<b>18.07</b>	<b>--</b>
<b>Total VOC</b>	<b>2.80</b>	<b>24.31</b>	<b>12.24</b>	<b>--</b>
<b>Total HAP</b>	<b>0.05</b>	<b>0.61</b>	<b>0.22</b>	<b>--</b>

Marathon Oil, LLC  
Maverick Spring Tank Battery  
Produced Water Skimmer Tanks

Identification - Vertical Fixed Roof Tanks		
Emission Source	Crude Oil Overflow Tank- 300 BBL	
Throughput (BPD)	2.00	
Throughput (BPY)	730	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	2.68	
Net Throughput (gal/yr)	30,660	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Metecrological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	6.78	
Water		
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>d</sup>	0.71	

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report.

Speciated Crude Oil Overflow Tank Emissions -CTK-2

Component	Crude Oil Overflow Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	4.51E-04	1.98E-03
CO2	1.01E-03	4.42E-03
Methane	1.58E-03	0.01
Ethane	3.30E-03	0.01
Propane	0.05	0.24
Isobutane	0.02	0.09
n-Butane	0.05	0.21
Isopentane	0.01	0.06
n-Pentane	0.02	0.07
i-C6	3.51E-03	0.02
n-Hexane	2.74E-03	0.01
Benzene	1.51E-04	6.60E-04
Cyclohexane	2.24E-04	9.82E-04
i-C7	5.20E-04	2.28E-03
n-Heptane	7.29E-05	3.19E-04
Toluene	3.06E-05	1.34E-04
2,2,4-Trimethylpentane	1.31E-05	5.75E-05
n-Octane	5.46E-04	2.39E-03
Ethylbenzene	2.57E-06	1.12E-05
m-Xylene	5.15E-06	2.26E-05
3-Methyloctane	--	--
n-Nonane	2.13E-04	9.35E-04
H2S	1.05E-03	4.60E-03
Water	2.36E-06	1.03E-05
TEG	--	--
C10+	1.15E-10	5.03E-10
<b>Total</b>	<b>0.17</b>	<b>0.74</b>
<b>Total CO2</b>	<b>1.01E-03</b>	<b>4.42E-03</b>
<b>Total Methane</b>	<b>1.58E-03</b>	<b>0.01</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.04</b>	<b>0.18</b>
<b>Total VOC</b>	<b>0.16</b>	<b>0.71</b>
<b>Total HAP</b>	<b>2.94E-03</b>	<b>0.01</b>

Marathon Oil, LLC  
Maverick Spring Tank Battery  
Produced Water Skimmer Tanks

Identification - Vertical Fixed Roof Tanks		
Emission Source	Crude Oil Reject Tank- 300 BBL	
Throughput (BPD)	10.00	
Throughput (BPY)	3,650	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	13.42	
Net Throughput (gal/yr)	153,300	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	6.78	
Water		
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	0.94	

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Crude Oil Reject Tank Emissions -CTK-3

Component	Reject Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	2.26E-03	0.01
CO2	0.01	0.02
Methane	0.01	0.03
Ethane	0.02	0.07
Propane	0.07	0.32
Isobutane	0.03	0.12
n-Butane	0.06	0.28
Isopentane	0.02	0.08
n-Pentane	0.02	0.10
i-C6	4.66E-03	0.02
n-Hexane	3.63E-03	0.02
Benzene	2.00E-04	8.75E-04
Cyclohexane	2.97E-04	1.30E-03
i-C7	6.90E-04	3.02E-03
n-Heptane	9.67E-05	4.23E-04
Toluene	4.05E-05	1.78E-04
2,2,4-Trimethylpentane	1.74E-05	7.62E-05
n-Octane	7.24E-04	3.17E-03
Ethylbenzene	3.41E-06	1.49E-05
m-Xylene	6.83E-06	2.99E-05
3-Methyloctane	--	--
n-Nonane	2.83E-04	1.24E-03
H2S	2.75E-03	0.01
Water	3.13E-06	1.37E-05
TEG	--	--
C10+	1.52E-10	6.68E-10
<b>Total</b>	<b>0.25</b>	<b>1.12</b>
<b>Total CO2</b>	<b>0.01</b>	<b>0.02</b>
<b>Total Methane</b>	<b>0.01</b>	<b>0.03</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.20</b>	<b>0.89</b>
<b>Total VOC</b>	<b>0.22</b>	<b>0.94</b>
<b>Total HAP</b>	<b>3.90E-03</b>	<b>0.02</b>

Marathon Oil , LLC  
Maverick Spring Tank Battery  
Produced Water Skimmer Tanks

Identification - Vertical Fixed Roof Tanks		
Emission Source	Crude Oil Slop Tank - 300 BBL	
Throughput (BPD)	10.00	
Throughput (BPY)	3,650	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	13.42	
Net Throughput (gal/yr)	153,300	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	6.78	
Water		
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	0.94	

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Crude Oil Slop Tank Emissions -CTK-4

Component	Crude Oil Slop Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	2.26E-03	0.01
CO2	0.01	0.02
Methane	0.01	0.03
Ethane	0.02	0.07
Propane	0.07	0.32
Isobutane	0.03	0.12
n-Butane	0.06	0.28
Isopentane	0.02	0.08
n-Pentane	0.02	0.10
i-C6	4.66E-03	0.02
n-Hexane	3.63E-03	0.02
Benzene	2.00E-04	8.75E-04
Cyclohexane	2.97E-04	1.30E-03
i-C7	6.90E-04	3.02E-03
n-Heptane	9.67E-05	4.23E-04
Toluene	4.05E-05	1.78E-04
2,2,4-Trimethylpentane	1.74E-05	7.62E-05
n-Octane	7.24E-04	3.17E-03
Ethylbenzene	3.41E-06	1.49E-05
m-Xylene	6.83E-06	2.99E-05
3-Methyloctane	--	--
n-Nonane	2.83E-04	1.24E-03
H2S	2.75E-03	0.01
Water	3.13E-06	1.37E-05
TEG	--	--
C10+	1.52E-10	6.68E-10
<b>Total</b>	<b>0.25</b>	<b>1.12</b>
<b>Total CO2</b>	<b>0.01</b>	<b>0.02</b>
<b>Total Methane</b>	<b>0.01</b>	<b>0.03</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.20</b>	<b>0.89</b>
<b>Total VOC</b>	<b>0.22</b>	<b>0.94</b>
<b>Total HAP</b>	<b>3.90E-03</b>	<b>0.02</b>

Marathon Oil , LLC  
Maverick Spring Tank Battery  
Produced Water Skimmer Tanks

Identification - Vertical Fixed Roof Tanks		
Emission Source	(3) Produced Water Skim Tanks- 1,000 BBL (each)	
Throughput (BPD)	25,921.67	
Throughput (BPY)	9,461,408	
Tank Dimensions		
Shell Height (ft)	16.0	
Diameter (ft)	21.0	
Volume (gal)	41,500	
Turnovers <sup>a</sup>	10,649.70	
Net Throughput (gal/yr)	397,379,150	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	6.78	
Water	99.9946%	
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	45.99	

Notes  
<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Produced Water Skim Tank Emissions (PER TANK) -WTK-1, WTK-2 & WTK-3

Component	Produced Water Skim Tanks- 1,000 BBL (each)			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	0.01	2.97	0.03	9.72
CO2	0.12	0.92	0.52	1.86
Methane	0.02	2.54	0.07	7.30
Ethane	4.10E-03	0.60	0.02	1.51
Propane	2.25E-03	2.12	0.01	5.66
Isobutane	1.93E-04	0.69	8.43E-04	1.86
n-Butane	4.35E-04	1.86	1.90E-03	5.07
Isopentane	2.70E-05	0.44	1.18E-04	1.22
n-Pentane	3.68E-06	0.27	1.61E-05	0.97
i-C6	6.31E-07	0.07	2.76E-06	0.24
n-Hexane	7.32E-08	0.03	3.21E-07	0.12
Benzene	2.07E-05	0.02	9.07E-05	0.03
Cyclohexane	5.12E-07	0.01	2.24E-06	0.03
i-C7	1.57E-08	0.03	6.88E-08	0.10
n-Heptane	3.03E-10	6.78E-04	1.33E-09	2.56E-03
Toluene	8.28E-07	2.95E-03	3.63E-06	0.01
2,2,4-Trimethylpentane	2.67E-10	1.89E-04	1.17E-09	5.76E-04
n-Octane	6.47E-11	2.22E-03	2.83E-10	0.01
Ethylbenzene	1.90E-08	2.30E-04	8.31E-08	3.68E-04
m-Xylene	2.13E-08	3.38E-04	9.34E-08	5.84E-04
3-Methyloctane	--	--	--	--
n-Nonane	1.22E-11	1.00E-03	5.32E-11	3.98E-03
H2S	0.02	0.13	0.07	0.26
Water	0.79	0.27	3.47	0.37
TEG	--	--	--	--
C10+	7.49E-23	1.04E-08	3.28E-22	1.77E-08
<b>Total</b>	<b>3.33</b>	<b>13.78</b>	<b>4.31</b>	<b>36.34</b>
<b>Total CO2</b>	<b>0.12</b>	<b>0.92</b>	<b>0.52</b>	<b>1.86</b>
<b>Total Methane</b>	<b>0.02</b>	<b>2.54</b>	<b>0.07</b>	<b>7.30</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.51</b>	<b>64.38</b>	<b>2.22</b>	<b>184.47</b>
<b>Total VOC</b>	<b>2.93E-03</b>	<b>5.55</b>	<b>0.01</b>	<b>15.32</b>
<b>Total HAP</b>	<b>2.16E-05</b>	<b>0.05</b>	<b>9.48E-05</b>	<b>0.15</b>

Marathon Oil EF, LLC  
Maverick Spring Tank Battery  
Heater Treaters

Background Information	
Emission Source	Heater Treater #1
Heater/Boiler rating (MMBtu/hr):	1
Rating above is:	below 100 MMBtu/hr, uncontrolled
Operating hours/year:	8760
Estimated Propane Usage (gal/hr):	397.4399
Fuel Heat Value (Btu/scf) <sup>a</sup> :	2516.10
Fuel Heat Value (Btu/gal) <sup>a</sup> :	91500
Fuel Rate (gal/yr):	801,540,000

<sup>a</sup> Heating value from AP-42 Table 1.5-1 for Propane (07/2008)

Pollutant	Emission Factor <sup>a</sup> (lb/10 <sup>3</sup> gal)	lb/hr	tpy
VOC	1.1	1.20E-05	5.27E-05
NOx	15	1.64E-04	7.18E-04
CO	8.4	9.18E-05	4.02E-04
PM <sub>10</sub>	0.8	8.74E-06	3.83E-05
PM <sub>2.5</sub>	0.8	8.74E-06	3.83E-05
SO <sub>2</sub>	0.09	9.84E-07	4.31E-06
<b>HAPS</b>			
Arsenic	0.0002	2.19E-09	9.57E-09
Benzene	0.0021	2.30E-08	1.01E-07
Beryllium	0.000012	1.31E-10	5.74E-10
Cadmium	0.0011	1.20E-08	5.27E-08
Chromium	0.0014	1.53E-08	6.70E-08
Cobalt	0.000084	9.18E-10	4.02E-09
Dichlorobenzene	0.0012	1.31E-08	5.74E-08
Formaldehyde	0.075	8.20E-07	3.59E-06
n-Hexane	1.8	1.97E-05	8.62E-05
Lead	0.0005	5.46E-09	2.39E-08
Manganese	0.00038	4.15E-09	1.82E-08
Mercury	0.00026	2.84E-09	1.24E-08
Naphthalene	0.00061	6.67E-09	2.92E-08
Nickel	0.0021	2.30E-08	1.01E-07
POM	0.000088	9.62E-10	4.21E-09
Toluene	0.0034	3.72E-08	1.63E-07
Selenium	0.000024	2.62E-10	1.15E-09
<b>Total HAPs</b>		<b>2.06E-05</b>	<b>9.04E-05</b>
<b>Other Pollutants</b>			
H <sub>2</sub> S	N/A <sup>c</sup>	--	--

<sup>a</sup> Emission factors are taken from AP-42, Chapter 1, Tables 1.5-1 dated July 2008.

<sup>b</sup> SO<sub>2</sub> emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>c</sup> H<sub>2</sub>S emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>d</sup> Greenhouse Gas Factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

<sup>e</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

Parameter	Value
scf/lbmole	379.3
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H2S molecular weight	34.08
SO2 molecular weight	64.06

GHG Pollutant Emissions <sup>d,e</sup>	
GHG CO <sub>2</sub> Factor:	120,000 lb/MMscf
GHG CH <sub>4</sub> Factor:	2.3 lb/MMscf
GHG N <sub>2</sub> O Factor:	2.2 lb/MMscf
GWP CO <sub>2</sub> Equivalent:	1
GWP CH <sub>4</sub> Equivalent:	25
GWP N <sub>2</sub> O Equivalent:	298
CO <sub>2</sub> emissions:	208.89 tpy
CH <sub>4</sub> emissions:	4.00E-03 tpy
N <sub>2</sub> O emissions:	3.83E-03 tpy
CO <sub>2</sub> e emissions:	210.14 tpy

H <sub>2</sub> S Max Concentration (ppmv)	H <sub>2</sub> S Mass to Heater Treater	H <sub>2</sub> S Mass to Heater Treater (tpy)
0	0.00E+00	0.00E+00

<sup>a</sup> H<sub>2</sub>S Mass to Heater Treater (lb/hr) = H<sub>2</sub>S Max Concentration (ppmv) / 10<sup>6</sup> \* Fuel Rate (scf/hr) / Standard Molar Volume (scf/lbmol) \* H<sub>2</sub>S MW (lb/lbmol)

Example Calculation (VOC):

EMISSION FACTOR	FEED RATE PER HOUR	HOURLY EMISSIONS	ANNUAL OPERATING HOURS	WEIGHT CONVERSION	ANNUAL EMISSIONS
1.1 lb VOC MMscf Natural Gas Burned	x 397.4399 MMscf hr	= 0.00 lb VOC hr	x 8,760 hours yr	x 1 ton 2,000 lbs	= 0.00 tons VOC yr

Criteria Pollutant Emission Factors obtained from AP-42 Nat Gas Combustion, Table 1.4-1, (7/98) < 100 MMBtu/hr heat input, & Table

Marathon Oil EF, LLC  
Maverick Spring Tank Battery  
Heater Treaters

Background Information	
Emission Source	Heater Treater #2
Heater/Boiler rating (MMBtu/hr):	1
Rating above is:	below 100 MMBtu/hr, uncontrolled
Operating hours/year:	8760
Estimated Propane Usage (gal/hr):	397.4399
Fuel Heat Value (Btu/scf) <sup>a</sup> :	2516.10
Fuel Heat Value (Btu/gal) <sup>a</sup> :	91500
Fuel Rate (gal/yr):	801,540,000

<sup>a</sup> Heating value from AP-42 Table 1.5-1 for Propane (07/2008)

Pollutant	Emission Factor <sup>a</sup> (lb/10 <sup>3</sup> gal)	lb/hr	tpy
VOC	1.1	1.20E-05	5.27E-05
NOx	15	1.64E-04	7.18E-04
CO	8.4	9.18E-05	4.02E-04
PM <sub>10</sub>	0.8	8.74E-06	3.83E-05
PM <sub>2.5</sub>	0.8	8.74E-06	3.83E-05
SO <sub>2</sub>	0.09	9.84E-07	4.31E-06
<b>HAPS</b>			
Arsenic	0.0002	2.19E-09	9.57E-09
Benzene	0.0021	2.30E-08	1.01E-07
Beryllium	0.000012	1.31E-10	5.74E-10
Cadmium	0.0011	1.20E-08	5.27E-08
Chromium	0.0014	1.53E-08	6.70E-08
Cobalt	0.000084	9.18E-10	4.02E-09
Dichlorobenzene	0.0012	1.31E-08	5.74E-08
Formaldehyde	0.075	8.20E-07	3.59E-06
n-Hexane	1.8	1.97E-05	8.62E-05
Lead	0.0005	5.46E-09	2.39E-08
Manganese	0.00038	4.15E-09	1.82E-08
Mercury	0.00026	2.84E-09	1.24E-08
Naphthalene	0.00061	6.67E-09	2.92E-08
Nickel	0.0021	2.30E-08	1.01E-07
POM	0.000088	9.62E-10	4.21E-09
Toluene	0.0034	3.72E-08	1.63E-07
Selenium	0.000024	2.62E-10	1.15E-09
<b>Total HAPs</b>		<b>2.06E-05</b>	<b>9.04E-05</b>
<b>Other Pollutants</b>			
H <sub>2</sub> S	N/A <sup>c</sup>	--	--

<sup>a</sup> Emission factors are taken from AP-42, Chapter 1, Tables 1.5-1 dated July 2008.

<sup>b</sup> SO<sub>2</sub> emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>c</sup> H<sub>2</sub>S emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>d</sup> Greenhouse Gas Factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

<sup>e</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

H <sub>2</sub> S Max Concentration (ppmv)	H <sub>2</sub> S Mass to Heater Treater	H <sub>2</sub> S Mass to Heater Treater (tpy)
0	0.00E+00	0.00E+00

<sup>a</sup> H<sub>2</sub>S Mass to Heater Treater (lb/hr) = H<sub>2</sub>S Max Concentration (ppmv) / 10<sup>5</sup> \* Fuel Rate (scf/hr) / Standard Molar Volume (scf/lbmol) \* H<sub>2</sub>S MW (lb/lbmol)

Example Calculation (VOC):

EMISSION FACTOR	FEED RATE PER HOUR	HOURLY EMISSIONS	ANNUAL OPERATING HOURS	WEIGHT CONVERSION	ANNUAL EMISSIONS
1.1 lb VOC / MMscf Natural Gas Burned	397.4399 MMscf / hr	0.00 lb VOC / hr	8,760 hours / yr	1 ton / 2,000 lbs	0.00 tons VOC / yr

Criteria Pollutant Emission Factors obtained from AP-42 Nat Gas Combustion, Table 1.4-1, (7/98) < 100 MMBtu/hr heat input; & Table 1.4-2, (7/98).

Parameter	Value
scf/lbmole	379.3
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H <sub>2</sub> S molecular weight	34.08
SO <sub>2</sub> molecular weight	64.06

GHG Pollutant Emissions <sup>d,e</sup>	
GHG CO <sub>2</sub> Factor:	120,000 lb/MMscf
GHG CH <sub>4</sub> Factor:	2.3 lb/MMscf
GHG N <sub>2</sub> O Factor:	2.2 lb/MMscf
GWP CO <sub>2</sub> Equivalent:	1
GWP CH <sub>4</sub> Equivalent:	25
GWP N <sub>2</sub> O Equivalent:	298
CO <sub>2</sub> emissions:	208.89 tpy
CH <sub>4</sub> emissions:	4.00E-03 tpy
N <sub>2</sub> O emissions:	3.83E-03 tpy
CO <sub>2</sub> e emissions:	210.14 tpy

Marathon Oil, LLC  
Maverick Spring Tank Battery

Planned MSS - Degassing Due to Passive Expansion / Thermal Expansion / Non-Forced Ventilation

	CTK-1	CTK-2	CTK-3	CTK-4	WTK-1	WTK-2	WTK-3
MSS Controls?	none						
Control Efficiency (%)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Event duration, hours/event	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Events per year	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Tank Diameter, ft	12.00	12.00	12.00	12.00	21	21	21
Tank Height, ft	15.00	15.00	15.00	15.00	16	16	16
<sup>a</sup> Vapor Space Volume, ft <sup>3</sup>	848.2	848.2	848.2	848.2	2,770.9	2,770.9	2,770.9
<sup>b</sup> Venting Gas MW (lb/lb-mol)	46.00	52.76	47.90	47.90	19.68	19.68	19.68
<sup>b</sup> VOC wt %	82.71%	95.64%	86.21%	86.21%	0.31%	0.31%	0.31%
<sup>b</sup> Benzene wt%	0.08%	0.09%	0.08%	0.08%	0.00%	0.00%	0.00%
<sup>b</sup> H <sub>2</sub> S wt%	1.06%	0.62%	1.10%	1.10%	1.63%	1.63%	1.63%
<sup>b</sup> HAPs wt%	1.50%	1.73%	1.56%	1.56%	0.00%	0.00%	0.00%
<sup>b</sup> CO <sub>2</sub> wt%	3.30%	0.59%	2.02%	2.02%	12.33%	12.33%	12.33%
<sup>b</sup> CH <sub>4</sub> wt%	4.75%	0.93%	3.16%	3.16%	1.63%	1.63%	1.63%
Tank Temperature, °F	66.84	66.84	66.84	66.84	66.84	66.84	66.84
True Vapor Pressure, psia	5.23	5.23	5.23	5.23	5.23	5.23	5.23
Emissions, lb/event	36.06	36.06	36.06	36.06	36.06	36.06	36.06
Hourly Total Emissions, lb/hr	36.06	36.06	36.06	36.06	36.06	36.06	36.06
Annual Total Emissions, TPY	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Total CO <sub>2</sub> , TPY	5.95E-04	1.07E-04	3.64E-04	3.64E-04	2.22E-03	2.22E-03	2.22E-03
Total Methane, TPY	8.57E-04	1.68E-04	5.70E-04	5.70E-04	2.94E-04	2.94E-04	2.94E-04
Total CO <sub>2</sub> e, TPY	0.02	4.30E-03	0.01	0.01	0.01	0.01	0.01
Total VOC, TPY	0.01	0.02	0.02	0.02	5.54E-05	5.54E-05	5.54E-05
Total HAP, TPY	2.70E-04	3.12E-04	2.81E-04	2.81E-04	4.09E-07	4.09E-07	4.09E-07
Total H <sub>2</sub> S, TPY	1.90E-04	1.12E-04	1.98E-04	1.98E-04	2.93E-04	2.93E-04	2.93E-04
Total Benzene, TPY	1.38E-05	1.60E-05	1.44E-05	1.44E-05	3.91E-07	3.91E-07	3.91E-07

Total Emissions	lb/hr	TPY
Total	252.41	0.13
Total CO <sub>2</sub>	16.20	0.01
Total Methane	6.10	0.00
Total CO <sub>2</sub> e	168.61	0.08
Total VOC	126.81	0.06
Total HAP	2.29	0.00
Total H <sub>2</sub> S	3.16	0.00
Total Benzene	0.12	0.00

Ideal Gas Constant, ((ft<sup>3</sup>\*psia)/(R\*lb-mol))  
10.73159

<sup>a</sup> Assuming 50% of tank is filled  
<sup>b</sup> From ProMax Tank Loss Stream

# APPENDIX B

Tribal NSR Synthetic Minor Forms





**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY  
40 CFR 49.151**

**Application For Synthetic Minor Limit  
(Form SYNMIN)**

Use of this information request form is voluntary and not yet approved by the Office of Management and Budget. The following is a check list of the type of information that Region 8 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. Use of application forms for this program is currently under Office of Management and Budget review and these information request forms will be replaced/updated after that review is completed.

**Please submit information to following two entities:**

Federal Minor NSR Permit Coordinator  
U.S. EPA, Region 8  
1595 Wynkoop Street, 8P-AR  
Denver, CO 80202-1129  
[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

For more information, visit:  
<http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8>

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact:

[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

**A. GENERAL INFORMATION**

Company Name (Who owns this facility?) <b>Marathon Oil Corporation</b>		Facility Name <b>Maverick Springs Tank Battery</b>	
Company Contact (Who is the <u>primary</u> contact for the company that owns this facility?) <b>Donna M. Stevison</b>			Title <b>Advanced HES Professional</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>			
Email Address <b>dmstevison@marathonoil.com</b>			
Telephone Number <b>(307) 527-2121</b>		Facsimile Number <b>(307) 527-3280</b>	

**B. ATTACHMENTS**

**For each criteria air pollutant, hazardous air pollutant and for all emission units and air pollutant-generating activities to be covered by a limitation, include the following:**

- Item 1** - The proposed limitation and a description of its effect on current actual, allowable and the potential to emit.
- Item 2** - The proposed testing, monitoring, recordkeeping, and reporting requirements to be used to demonstrate and assure compliance with the proposed limitation.
- Item 3** - A description of estimated efficiency of air pollution control equipment under present or anticipated operating conditions, including documentation of the manufacturer specifications and guarantees.
- Item 4** - Estimates of the Post-Change Allowable Emissions that would result from compliance with the proposed limitation, including all calculations for the estimates.
- Item 5** - Estimates of the potential emissions of Greenhouse Gas (GHG) pollutants.

The public reporting and recordkeeping burden for this collection of information is estimated to average 6 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

## **Instructions**

**Submit this form in addition to FORM NEW.**

### **1. Who Can Request Federally-Enforceable Limitations Under the Tribal NSR Authority?**

The Tribal NSR Rule applies only to sources located within the exterior boundaries of an Indian reservation in the United States of America or other lands as specified in 40 CFR part 49, collectively referred to as "Indian country". So, to use the authority in the Tribal NSR Rule to create federally-enforceable limitations, a source must be located within Indian country. Land ownership status (for example, whether the land is owned by a Tribal member or whether the land is owned in fee or in trust) does not affect how the rule applies.

### **2. Who Might Want to Request Federally-Enforceable Limitations?**

The primary reason for requesting federally-enforceable limitations is to avoid an otherwise applicable federal Clean Air Act program, rule or requirement. Many federal Clean Air Act programs use a source's "potential to emit" (PTE) air pollution to determine which rules or requirements apply. A source's PTE is based on the maximum annual operational (production, throughput, etc) rate of the source taking into consideration the capacity and configuration of the equipment and operations. Emission or operational limits can also be taken into consideration as maximums if they are federally enforceable. So, using a synthetic minor NSR permit to establish federally enforceable limitations can lower a source's PTE and possibly allow the source to avoid certain federal Clean Air Act requirements.

Three examples of federal Clean Air Act programs that use PTE to determine whether they apply are (1) the Prevention of Significant Deterioration (PSD) construction permitting program, (2) the Title V operating permit program, and (3) the Maximum Achievable Control Technology (MACT) program. For example, existing sources that are considered "major" for Title V (meaning they have the potential to emit air pollution at levels defined in that rule as "major") must apply for a Title V operating permit. If a source accepts a federally-enforceable limitation through a synthetic minor NSR permit that reduces their PTE to below the "major" threshold, and the source does not meet any of the other requirements that would trigger applicability to the part 71 program, then the source no longer needs a Title V operating permit. When planning for the construction of a new source or expansion of an existing source, a source can also accept limitations on PTE (using a synthetic minor NSR permit) that allow the source to avoid PSD. Limitations on PTE can similarly help a source to avoid new MACT standards that would otherwise apply to the source.

### 3. Section B. ATTACHMENTS

This section lists the information that must be attached to the application form for each requested limitation. The requested limitation(s) must be described for each affected emissions unit (or pollutant-generating activity) and pollutant and must be accompanied by the supporting information listed on the form and described below. Note that applicability of many federal Clean Air Act requirements (such as Title V, PSD and MACT) is often based on source-wide emission levels of specific pollutants. In that case, all emissions units at a source and all pollutants regulated by that given rule or regulation must be addressed by this section of the application form.

**Item 1** – The requested limitation and its effect on actual emissions or potential to emit must be presented in enough detail to document how the limitation will limit the source’s actual or potential emissions as a legal and practical matter and, if applicable, will allow the source to avoid an otherwise applicable requirement. The information presented must clearly explain how the limitation affects each emission unit and each air pollutant from that emission unit. Use the information provided in response to Item 4 below to explain how the limitation affects emissions before and after the limitation is in effect.

**Item 2** – For each requested limitation, the application must include proposed testing, monitoring, recordkeeping and reporting that will be used to demonstrate and assure compliance with the limitation. Testing approaches should incorporate and reference appropriate EPA reference methods where applicable. Monitoring should describe the emission, control or process parameters that will be relied on and should address frequency, methods, and quality assurance.

**Item 3** – The application must include a description and estimated efficiency of air pollution control equipment under present or anticipated operating conditions. For control equipment that is not proposed to be modified to meet the requested limit, simply note that fact; however, for equipment that is proposed to be modified (e.g. improved efficiency) or newly installed to meet the proposed limit, address both current and future descriptions and efficiencies. Include manufacturer specifications and guarantees for each control device.

**Items 4** – Any emission estimates submitted to the Reviewing Authority must be verifiable using currently accepted engineering criteria. The following procedures are generally acceptable for estimating emissions from air pollution sources:

- (i) Source-specific emission tests;
- (ii) Mass balance calculations;
- (iii) Published, verifiable emission factors that are applicable to the source. (i.e., manufacturer specifications).
- (iv) Other engineering calculations; or
- (v) Other procedures to estimate emissions specifically approved by the Reviewing Authority.

**Post-Change Allowable Emissions:** A source’s allowable emissions for a pollutant is expressed in tpy and generally is calculated by multiplying the allowed hourly emissions rate in pounds per hour (lbs/hr) times allowed hours (which is the number of hours in a year) and dividing by 2,000 (which is the number of pounds in a ton).

**Item 5** - New construction projects that have the potential to emit GHG emissions of at least 100,000 tpy CO<sub>2</sub>e and 100 or 250 tpy on a mass basis, modifications at existing PSD facilities that increase GHG emissions by at least 75,000 tpy CO<sub>2</sub>e and minor sources that increase GHG emissions by at least 100,000 tpy CO<sub>2</sub>e and 100 or 250 tpy on a mass basis are subject to PSD permitting requirements, even

if they do not significantly increase emissions of any other pollutant. As such, any requested limits to avoid PSD must take into account greenhouse gases.

Therefore, please include in your permit application estimates of the potential emissions of the following pollutants. More information about GHG permitting and how to calculate CO<sub>2</sub> equivalents (CO<sub>2</sub>e), the mass emissions of each individual GHG adjusted for its Global Warming Potential (GWP) can be found at: <http://epa.gov/nsr/ghgdocs/ghgpermittingguidance.pdf>

1. Carbon dioxide (CO<sub>2</sub>)
2. Methane (CH<sub>4</sub>) and its CO<sub>2</sub>e
3. Nitrous oxide (N<sub>2</sub>O) and its CO<sub>2</sub>e
4. Hydrofluorocarbons (HFCs) and its CO<sub>2</sub>e
5. Perfluorocarbons (PFCs) and its CO<sub>2</sub>e
6. Sulfur hexafluoride (SF<sub>6</sub>) and its CO<sub>2</sub>e



**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN  
COUNTRY  
40 CFR 49.151  
Application for New Construction  
(Form NEW)**

**Please check all that apply to show how you are using this form:**

- Proposed Construction of a New Source
- Proposed Construction of New Equipment at an Existing Source
- Proposed Modification of an Existing Source
- Other – Please Explain (*Previously “de Minimus” source & increased production*)

Use of this information request form is voluntary and not yet approved by the Office of Management and Budget. The following is a check list of the type of information that Region 8 will use to process information on your proposed project. While submittal of this form is not required, it does offer details on the information we will use to complete your requested approval and providing the information requested may help expedite the process. Use of application forms for this program is currently under Office of Management and Budget review and these information request forms will be replaced/updated after that review is completed.

**Please submit information to following two entities:**

Federal Minor NSR Permit Coordinator  
U.S. EPA, Region 8  
1595 Wynkoop Street, 8P-AR  
Denver, CO 80202-1129  
[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

For more information, visit:  
<http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8>

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact:  
[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

**A. GENERAL SOURCE INFORMATION**

1. (a) Company Name (Who owns this facility?) <b>Marathon Oil Corporation</b>		2. Facility Name <b>Maverick Springs Tank Battery</b>	
(b) Operator Name (Is the company that operates this facility different than the company that owns this facility? What is the name of the company?) <b>Marathon Oil Corporation</b>			
3. Type of Operation <b>Oil Production</b>		4. Portable Source? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
		5. Temporary Source? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
6. NAICS Code <b>211111</b>		7. SIC Code <b>1311</b>	
8. Physical Address (Or, home base for portable sources) <b>N/A</b>			
9. Reservation* <b>Wind River</b>	10. County* <b>Fremont</b>	11a. Latitude (decimal format)* <b>43.48412168</b>	11b. Longitude (decimal format)* <b>-108.9780133</b>
12a. Quarter Quarter Section* <b>NESW</b>	12b. Section* <b>22</b>	12c. Township* <b>6N</b>	12d. Range* <b>2W</b>

**C. CONTACT INFORMATION**

<b>Company Contact</b> (Who is the <u>primary</u> contact for the company that owns this facility?) Donna M. Stevison		Title <b>Advanced HES Professional</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>dmstevison@marathonoil.com</b>		
Telephone Number <b>(307) 527-2121</b>	Facsimile Number <b>(307) 527-3280</b>	
<b>Operator Contact</b> (Is the company that operates this facility different than the company that owns this facility? Who is the <u>primary</u> contact for the company that operates this facility?) Donna M. Stevison		Title <b>Advanced HES Professional</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>dmstevison@marathonoil.com</b>		
Telephone Number <b>(307) 527-2121</b>	Facsimile Number <b>(307) 527-3280</b>	
<b>Permitting Contact</b> (Who is the person <u>primarily</u> responsible for Clean Air Act permitting for the company? We are seeking one main contact for the company. Please do not list consultants.) Donna M. Stevison		Title <b>Advanced HES Professional</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>dmstevison@marathonoil.com</b>		
Telephone Number <b>(307) 527-2121</b>	Facsimile Number <b>(307) 527-3280</b>	
<b>Compliance Contact</b> (Is the person responsible for Clean Air Act compliance for this company different than the person responsible for Clean Air Act permitting? Who is the person <u>primarily</u> responsible for Clean Air Act compliance for the company? We are seeking one main contact for the company. Please do not list consultants.) Donna M. Stevison		Title <b>Advanced HES Professional</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>dmstevison@marathonoil.com</b>		
Telephone Number <b>(307) 527-2121</b>	Facsimile Number <b>(307) 527-3280</b>	

\*Provide all proposed locations of operation for portable sources

**B. PREVIOUS PERMIT ACTIONS** (Provide information in this format for each permit that has been issued to this source. Provide as an attachment if additional space is necessary)

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

Facility Name on the Permit
Permit Number (xx-xxx-xxxxx-xxxx.xx)
Date of the Permit Action

## D. ATTACHMENTS

**Include all of the following information** (see the attached instructions)

\*Please do not send Part 71 Operating Permit Application Forms in lieu of the check list below.

- FORM SYNMIN** - New Source Review Synthetic Minor Limit Request Form, if synthetic minor limits are being requested.
- Narrative description of the proposed production processes. This description should follow the flow of the process flow diagram to be submitted with this application.
- Process flow chart identifying all proposed processing, combustion, handling, storage, and emission control equipment.
- A list and descriptions of all proposed emission units and air pollution-generating activities.
- Type and quantity of fuels, including sulfur content of fuels, proposed to be used on a daily, annual and maximum hourly basis.
- Type and quantity of raw materials used or final product produced proposed to be used on a daily, annual and maximum hourly basis.
- Proposed operating schedule, including number of hours per day, number of days per week and number of weeks per year.
- A list and description of all proposed emission controls, control efficiencies, emission limits, and monitoring for each emission unit and air pollution generating activity.
- Criteria Pollutant Emissions** - Estimates of Current Actual Emissions, Current Allowable Emissions, Post-Change Uncontrolled Emissions, and Post-Change Allowable Emissions for the following air pollutants: particulate matter, PM<sub>10</sub>, PM<sub>2.5</sub>, sulfur oxides (SO<sub>x</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub>), hydrogen sulfide (H<sub>2</sub>S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.  
  
These estimates are to be made for each emission unit, emission generating activity, and the project/source in total. Note, there are no insignificant emission units or activities in this permitting program, only exempted units and activities. Please see the regulation for a list of exempted units and activities.
- Air Quality Review**
- ESA (Endangered Species Act)**
- NHPA (National Historic Preservation Act)**

## E. TABLE OF ESTIMATED EMISSIONS

The following tables provide the total emissions in tons/year for all pollutants from the calculations required in Section D of this form, as appropriate for the use specified at the top of the form.

### E(i) – Proposed New Source

Pollutant	Potential Emissions (tpy)	Proposed Allowable Emissions (tpy)	
PM	7.66E-05	4.22E-03	PM - Particulate Matter PM <sub>10</sub> - Particulate Matter less than 10 microns in size PM <sub>2.5</sub> - Particulate Matter less than 2.5 microns in size SO <sub>2</sub> - Sulfur Oxides NO <sub>x</sub> - Nitrogen Oxides CO - Carbon Monoxide VOC - Volatile Organic Compound Pb - Lead and lead compounds Fluorides - Gaseous and particulates H <sub>2</sub> SO <sub>4</sub> - Sulfuric Acid Mist H <sub>2</sub> S - Hydrogen Sulfide TRS - Total Reduced Sulfur RSC - Reduced Sulfur Compounds
PM <sub>10</sub>	7.66E-05	4.22E-03	
PM <sub>2.5</sub>	7.66E-05	4.22E-03	
SO <sub>2</sub>	8.62E-06	1.03	
NO <sub>x</sub>	0.14	0.16	
CO	1.17	1.36	
VOC	146.76	62.95	
Pb	--	--	
Fluorides	--	--	
H <sub>2</sub> SO <sub>4</sub>	--	--	
H <sub>2</sub> S	1.77	1.17	
TRS	--	--	
RSC	--	--	

Emissions calculations must include fugitive emissions if the source is one the following listed sources, pursuant to CAA Section 302(j):

- (a) Coal cleaning plants (with thermal dryers);
- (b) Kraft pulp mills;
- (c) Portland cement plants;
- (d) Primary zinc smelters;
- (e) Iron and steel mills;
- (f) Primary aluminum ore reduction plants;
- (g) Primary copper smelters;
- (h) Municipal incinerators capable of charging more than 250 tons of refuse per day;
- (i) Hydrofluoric, sulfuric, or nitric acid plants;
- (j) Petroleum refineries;
- (k) Lime plants;
- (l) Phosphate rock processing plants;
- (m) Coke oven batteries;
- (n) Sulfur recovery plants;
- (o) Carbon black plants (furnace process);
- (p) Primary lead smelters;
- (q) Fuel conversion plants;
- (r) Sintering plants;
- (s) Secondary metal production plants;
- (t) Chemical process plants
- (u) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input;
- (v) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
- (w) Taconite ore processing plants;
- (x) Glass fiber processing plants;
- (y) Charcoal production plants;
- (z) Fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input, and
- (aa) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

**E(ii) – Proposed New Construction at an Existing Source or Modification of an Existing Source**

<b>Pollutant</b>	<b>Current Actual Emissions (tpy)</b>	<b>Current Allowable Emissions (tpy)</b>	<b>Post-Change Potential Emissions (tpy)</b>	<b>Post-Change Allowable Emissions (tpy)</b>
PM				
PM <sub>10</sub>				
PM <sub>2.5</sub>				
SO <sub>2</sub>				
NO <sub>x</sub>				
CO				
VOC				
Pb				
Fluorides				
H <sub>2</sub> SO <sub>4</sub>				
H <sub>2</sub> S				
TRS				
RSC				

- PM - Particulate Matter
- PM<sub>10</sub> - Particulate Matter less than 10 microns in size
- PM<sub>2.5</sub> - Particulate Matter less than 2.5 microns in size
- SO<sub>2</sub> - Sulfur Oxides
- NO<sub>x</sub> - Nitrogen Oxides
- CO - Carbon Monoxide
- VOC - Volatile Organic Compound
- Pb - Lead and lead compounds
- Fluorides - Gaseous and particulates
- H<sub>2</sub>SO<sub>4</sub> - Sulfuric Acid Mist
- H<sub>2</sub>S - Hydrogen Sulfide
- TRS - Total Reduced Sulfur
- RSC - Reduced Sulfur Compounds

The public reporting and recordkeeping burden for this collection of information is estimated to average 20 hours per response, unless a modeling analysis is required. If a modeling analysis is required, the public reporting and recordkeeping burden for this collection of information is estimated to average 60 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

## Instructions

(Please do not include a copy of these instructions in the application you submit to us.)

### Use of This Form

- Proposed new construction or modifications should first be evaluated to determine if the change is major under the major NSR program using the procedures at 40 CFR 52.21 (i.e., baseline actual to projected actual applicability test). If the proposed construction does not qualify as a major under that test, then it may be subject to the requirements of the minor NSR rule at 40 CFR 49.151.

**Helpful Definitions from the Federal Minor NSR Rule (40 CFR 49)** – This is not a comprehensive list.

- 40 CFR 49.152(d) - Modification* means any physical or operational change at a source that would cause an increase in the allowable emissions of the affected emissions units for any regulated NSR pollutant or that would cause the emission of any regulated NSR pollutant not previously emitted.

The following exemptions apply:

- (1) A physical or operational change does not include routine maintenance, repair, or replacement.
  - (2) An increase in the hours of operation or in the production rate is not considered an operational change unless such increase is prohibited under any federally-enforceable permit condition or other permit condition that is enforceable as a practical matter.
  - (3) A change in ownership at a source is not considered a modification.
- 40 CFR 49.152(d) - Allowable emissions* means “allowable emissions” as defined in §52.21(b)(16), except that the allowable emissions for any emissions unit are calculated considering any emission limitations that are enforceable as a practical matter on the emissions unit’s potential to emit.
  - 52.21(b)(16) - Allowable emissions* means the emissions rate of a stationary source calculated using the maximum rated capacity of the source (unless the source is subject to federally enforceable limits which restrict the operating rate, or hours of operation, or both) and the most stringent of the following:
    - (i) The applicable standards as set forth in 40 CFR parts 60 and 61;
    - (ii) The applicable State Implementation Plan emissions limitation, including those with a future compliance date; or
    - (iii) The emissions rate specified as a federally enforceable permit condition, including those with a future compliance date.

## **A. General Facility Information**

1. Company Name & Operator Name (if the operator of the facility is different than the owner, please provide this information): Provide the complete company and operator names. For corporations, include divisions or subsidiary names, if any.
2. Facility Name: Provide the facility name. Please note that a facility is a site, place, location, etc... that may contain one or more air pollution emitting units.
3. Type of Operation: Indicate the generally accepted name for the operation (i.e., asphalt plant, gas station, dry cleaner, sand & gravel mining, oil and gas wellsite, tank battery, etc.).
4. Portable Source: Will this facility operate in more than one location? Some examples of portable sources include asphalt batch plants and concrete batch plants.
5. Temporary Source: A temporary source, in general, would have emissions that are expected last less than 12 months.
6. NAICS Code: North American Industry Classification System. The NAICS Code for your facility can be found at the following link → [North American Industry Classification System](http://www.census.gov/epcd/naics/nsic2ndx.htm#S1) (<http://www.census.gov/epcd/naics/nsic2ndx.htm#S1>).
7. SIC Code: Standard Industrial Classification Code. Although the new North American Industry Classification System (NAICS) has replaced the SIC codes, much of the Clean Air Act permitting processes continue to use these codes. The SIC Code for your facility can be found at the following link → [Standard Industrial Classification Code](http://www.osha.gov/pls/imis/sic_manual.html) ([http://www.osha.gov/pls/imis/sic\\_manual.html](http://www.osha.gov/pls/imis/sic_manual.html)).
8. Physical Address: Provide the actual address of where you are proposing to construct the new facility, not the mailing address. Include the State and the ZIP Code.
9. Reservation: Provide the name of the Indian reservation within which the facility will be constructed.
10. County: Provide the County within which the source will be constructed.
- 11a & 11b. Latitude & Longitude: These are GPS (global positioning system) coordinates.
- 12a – 12d. Section-Township-Range: Please provide these coordinates in 1/4 Section/Section/Township/Range. (e.g., SW ¼, NE ¼ S36/T10N/R21E).

## **B. Current Permit Information**

Provide a list of all air quality permits that have been issued for this facility. This should include any Federal Minor New Source Review (MNSR), Prevention of Significant Deterioration (PSD) or Non-Attainment New Source Review (NA NSR) permits, in addition to the most recent Part 71 permit. The permit number must be included with each permit identified.

## **C. Contact Information**

Please provide the information, requested, in full.

1. Company Contact: Provide the full name of the primary contact for the company that owns the facility.
2. Operator Contact: Provide the name of the primary contact for the company that operates the facility if the company operating the facility is different from the company that owns the facility.

3. Permitting Contact: Provide the name of primary contact, for permitting decisions, at the company that owns the facility or the company that operates the facility.

4. Compliance Contact: Provide the name of primary contact, responsible for compliance of the facility, at the company that owns the facility or the company that operates the facility. If this is the same as the Permitting Contact please note this on the form.

#### **D. Attachments**

This section lists the information needed to complete the requested approval. This information should be accompanied by the supporting information listed on the form and described below. The information should be presented in enough detail to document how the facility is currently operating and/or how it is proposed to be operated.

##### **FORM SYNMIN**

If synthetic minor limits are being requested, a synthetic Minor Limit Application should be included with this application.

##### Narrative description of the proposed production processes.

1. The narrative description should follow the flow of the process flow diagram to be submitted with this application. This needs to be as comprehensive as possible to help in understanding the proposed facility and how it will be operated. For example:

What are the raw materials?

What are the properties of the raw materials?

Does the production process include heating, drying, the application of chemicals, etc?

How will the raw materials be affected by this process?

What are the out puts from each step of the process (i.e., crushed ore, dry gas, water, etc...)?

Etc....

2. The proposed operating schedule presented in terms of hours per day, days per week, and weeks per year.
3. A list of the type and quantity of fuels and/or raw materials used. Each fuel and raw material should be described in enough detail to indicate its basic chemical components.

##### A process flow chart identifying all proposed processing, combustion, handling, storage, and emission control equipment. This flow chart should illustrate the detailed narrative description requested above.

##### List and describe all proposed units, emission units and air pollution-generating activities. At a minimum, provide the following:

1. The hourly, daily and annual maximum operating rates for each operating unit, production process, and activity.
2. The hourly, daily and annual maximum firing rates for each fuel and combustion equipment.
3. The capacity for storage units and the hourly, daily and annual maximum throughput of material in the storage units.
4. Material and product handling equipment and the hourly, daily and annual maximum throughput of material and product.
5. Tank designs, tank storage capacities, hourly, daily and annual maximum throughput of material and product.

- Type and quantity of fuels, including sulfur content of fuels, proposed to be used on a daily, annual and maximum hourly basis.
- Type and quantity of raw materials used or final product produced proposed to be used on a daily, annual and maximum hourly basis.
- Proposed operating schedule, including number of hours per day, number of days per week and number of weeks per year.
- A list and description of all proposed emission controls, control efficiencies, emission limits, and monitoring for each emission unit and air pollution generating activity.
  1. Include manufacturer specifications and guarantees for each control device.

### Criteria Pollutant Emissions Estimates

- Estimates of Current Actual Emissions, Current Allowable Emissions, Post-Change Uncontrolled Emissions, and Post-Change Allowable Emissions for the following air pollutants: particulate matter, PM<sub>10</sub>, PM<sub>2.5</sub>, sulfur oxides (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, ammonia (NH<sub>3</sub>), fluorides (gaseous and particulate), sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub>), hydrogen sulfide (H<sub>2</sub>S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.
  1. These estimates are to be made for each emission unit, emission generating activity, in addition to total emissions.
  2. The information should include all of the supporting calculations, assumptions and references. Emission estimates must address all emission units and pollutants proposed and/or affected by the limitation and be presented in short term (e.g. pounds per hour) as well as annual (tons per year) units.
  3. Any emission estimates submitted to the Regional Administrator must be verifiable using currently accepted engineering criteria. The following procedures are generally acceptable for estimating emissions from air pollution sources:
    - Unit-specific emission tests;
    - Mass balance calculations;
    - Published, verifiable emission factors that are applicable to the unit. (i.e. manufacturer specifications)
    - Other engineering calculations; or
    - Other procedures to estimate emissions specifically approved by the Regional Administrator.
  4. Guidance for estimating emissions can be found at <http://www.epa.gov/ttn/chief/efpac/index.html>.

Current Actual Emissions: Current actual emissions for a pollutant is expressed in tpy and generally is calculated by multiplying the actual hourly emissions rate in pounds per hour (lbs/hr) times actual hours operated (which is the number of hours in a year) and dividing by 2,000 (which is the number of pounds in a ton).

1. For an **existing air pollution source (permitted and unpermitted)** that operated prior to the application submittal, the current actual emissions are the actual rate of emissions for

the preceding calendar year and must be calculated using the actual operating hours, production rates, in-place control equipment, and types of materials processed, stored, or combusted during the preceding calendar year. The emission estimates must be based upon actual test data or, in the absence of such data, upon procedures acceptable to the Regional Administrator.

Current Allowable Emissions: Current allowable emissions for a pollutant is expressed in tpy and generally is calculated by multiplying the allowed hourly emissions rate in pounds per hour (lbs/hr) times allowed hours (which is the number of hours in a year) and dividing by 2,000 (which is the number of pounds in a ton).

1. "Allowed" means the source is restricted by permit conditions that limit its emissions and are enforceable as a practical matter (i.e., allowable emissions). The allowable emissions for any emissions unit are calculated considering any emissions limitations that are enforceable as a practical matter on the unit's PTE.
2. For an **existing permitted air pollution source** that operated prior to the application submittal, the current allowable emissions are the allowable rate of emissions for the preceding calendar year and must be calculated using the permitted operating hours, production rates, in-place control equipment, and types of materials processed, stored, or combusted during the preceding calendar year.
3. For an **existing air pollution source** that does not have an established allowable emissions level prior to the modification must report the pre-change uncontrolled emissions.

Post-Change Potential Emissions (Potential uncontrolled emissions from proposed project): This is the maximum capacity of a source to emit a pollutant under its physical and operational design. This is expressed in tpy and generally is calculated by multiplying the maximum hourly emissions rate in pounds per hour (lbs/hr) times 8,760 hours (which is the number of hours in a year) and dividing by 2,000 (which is the number of pounds in a ton).

Post-Change Allowable Emissions: A source's allowable emissions for a pollutant is expressed in tpy and generally is calculated by multiplying the allowed hourly emissions rate in pounds per hour (lbs/hr) times allowed hours (which is the number of hours in a year) and dividing by 2,000 (which is the number of pounds in a ton).

1. Unless the source is restricted by permit conditions or other requirements that are enforceable as a practical matter, the post-change allowable emissions would be equivalent to post-change uncontrolled emissions. For the post-change allowable emissions a lower level of allowable emissions may be proposed.
2. For physical or operational changes at minor sources and for minor physical or operational changes at major sources, the total increase in allowable emissions resulting from your proposed change would be the sum of following:
  - For each new emissions unit that is to be added, the emissions increase would be the potential to emit of each unit.
  - For each emissions unit with an allowable emissions limit that is to be changed or replaced, the emissions increase would be the allowable emissions of the emissions unit after the change or replacement minus the allowable emissions prior to the change or replacement. However, this may not be a negative value. If the allowable emissions of an emissions unit would be reduced as a result of the change or replacement, use zero in the calculation.

- For each unpermitted emissions unit (i.e., a unit without any emissions limitations before the change) that is to be changed or replaced, the emissions increase would be the allowable emissions of the unit after the change or replacement minus the potential to emit prior to the change or replacement. However, this may not be a negative value. If the allowable emissions of an emissions unit would be reduced as a result of the change or replacement, use zero in the calculation.

#### **Air Quality Review**

Provide a narrative description of the current air quality conditions and the expected impact the permitted source would have on that air quality. Factors to include in the qualitative discussion are meteorology, terrain, elevation, distance to ambient air, expected emissions, stack heights, etc...

Your reviewing authority may require you to provide additional information used to determine impacts that may result from your new source or modification. You may be required to conduct and submit an Air Quality Impact Analysis (AQIA) using dispersion modeling in accordance with 40 CFR part 51, Appendix W. If required, and the AQIA demonstrates that construction of your source or modification would cause or contribute to a NAAQS or PSD increment violation, you will also be required to further reduce its impact before you could obtain a permit.

#### **ESA**

The Endangered Species Act requires us, in consultation with the U.S. Fish and Wildlife Service and/or the NOAA Fisheries Service, to ensure that actions we authorize are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species.

To expedite the approval of your proposed construction, we encourage you to identify any listed species that you may be readily aware of that could be affected by your proposal. The following website has been provided to assist you: <http://www.fws.gov/endangered/>

Simply enter the State and County in which you propose to construct to obtain a general listing.

#### **NHPA**

The National Historic Preservation Act requires us, in consultation with State and/or Tribal Historic Preservation Officers to ensure that actions we authorize are not likely to affect cultural resources.

To expedite the approval of your proposed construction, we encourage you to identify any cultural resources that you may be readily aware of that could be affected by your proposal. The following website has been provided to assist you:

<http://nrhp.focus.nps.gov/natreghome.do?searchtype=natreghome>

Simply enter the State and County in which you propose to construct to obtain a general listing.

# APPENDIX C

## Laboratory Analyses





GAS MEASUREMENT

EMISSIONS TESTING

LABORATORY

866.985.0866

www.Precision-Labs.com

## Flash Liberation of Separator Emulsion

<b>Client:</b>	Marathon	<b>Sample Lab ID:</b>	16021013-02
<b>Site Name:</b>	FWKO #3	<b>Analyst:</b>	AP
<b>Unique Number:</b>	Not Indicated	<b>Date Analyzed:</b>	02/11/16
<b>Date Sampled:</b>	02/05/16		
<b>State:</b>	ND	<b>Site Notes:</b>	
<b>County:</b>	Not Indicated		

### Flash Liberation of Separator Emulsion Conditions

	Pressure (psig)	Temperature (°F)
Separator Emulsion	27.0	81.0
Stock Tank	0.0	70

### Base Conditions

	Pressure (psi)	Temperature (°F)
Base Conditions	14.73	60

### Flash Liberation of Separator Emulsion Results

Parameter	Result	Units/Description
Gas Emulsion Ratio	0.2	SCF flashed vapor/bbl stock tank emulsion
Gas Specific Gravity	2.146	Air = 1.000
Separator Volume Factor	1.000	Separator Volume/Stock tank Volume

### Quality Control Summary

Duplicate Results	% Difference	Acceptable Range
Gas Emulsion Ratio	0.0	<10%
Cylinder Type	Piston	
Sample Collection Rate (mL/min)	40	<60 mL/min



GAS MEASUREMENT

EMISSIONS TESTING

LABORATORY

866.945.8166

www.PrecisionLabs.com

## Gas Evolved from Flashed Separator Emulsion

<b>Run File:</b>	C:\Galaxie\data\16_02_11\16021013-021.DATA		
<b>Method:</b>	S2_ExtBTEX		
<b>Operator</b>	AP	<b>Analysis Date</b>	2/11/2016
<b>Client:</b>	Marathon	<b>Date Sampled:</b>	2/11/2016
<b>Site Name:</b>	FWKO #3	<b>Purpose:</b>	Flash Gas Analysis
<b>Unique #:</b>	Not Indicated	<b>Pressure:</b>	Ambient
<b>Sample Temperature:</b>	70°F	<b>Type Sample:</b>	Spot
<b>Sampled by:</b>	AP	<b>County:</b>	Not Indicated

COMPONENT	MOLE %	GPM
Hydrogen Sulfide	0.000	0.000
Nitrogen (N2)	2.791	
Carbon Dioxide	6.724	
Methane (CH4)	5.872	
Ethane (C2)	1.363	0.364
Propane (C3)	8.133	2.235
iso-Butane (i-C4)	5.448	1.778
Butane (C4)	18.681	5.874
iso-Pentane (i-C5)	10.896	3.975
Pentane (C5)	18.137	6.558
Hexanes	13.856	1.455
Heptanes Plus	8.098	6.941
<b>Totals</b>	<b>100.000</b>	<b>29.179</b>

Specific Gravity	2.146
Compressibility (Z)	0.9587
Molecular Weight	62.80

Saturated Ideal BTUs	3185.7	Saturated Real BTUs	3323.0
Dry Ideal BTUs	3242.1	Dry Real BTUs	3381.8

Base Conditions:                      14.73 psi                                      60 °F

## Gas Evolved from Flashed Separator Emulsion Extended Analysis Report

COMPONENT	MOLE %	BTU	GPM	WT %
Hydrogen Sulfide	0.000	0.000	0.000	0.000
Nitrogen (N2)	2.791			1.245
Carbon Dioxide	6.724			4.712
Methane (CH4)	5.872	59.449		1.500
Ethane (C2)	1.363	24.180	0.364	0.653
Propane (C3)	8.133	205.106	2.235	5.711
iso-Butane (i-C4)	5.448	177.571	1.778	5.042
Butane (C4)	18.681	610.837	5.874	17.291
iso-Pentane (i-C5)	10.896	436.942	3.975	12.519
Pentane (C5)	18.137	728.731	6.558	20.838
2,2-Dimethylbutane	0.493	17.340	0.146	0.550
Cyclopentane	3.694	130.053	1.091	4.126
2,3-Dimethylbutane	0.739	26.011	0.218	0.825
2-Methylpentane	1.359	59.854	0.553	1.864
3-Methylpentane	0.800	35.243	0.325	1.098
n-Hexane	4.818	229.692	1.976	6.612
Methylcyclopentane	1.115	61.477	0.513	1.779
Benzene	1.322	47.591	0.369	1.645
Cyclohexane	1.215	50.923	0.412	1.629
2-Methylhexane	0.304	12.730	0.103	0.407
3-Methylhexane	0.434	18.186	0.147	0.582
2,2,4-Trimethylpentane	0.106	6.156	0.055	0.193
Other Heptanes (C7's)	1.858	102.461	0.855	2.964
n-Heptane	0.743	40.984	0.342	1.186
Methylcyclohexane	0.956	46.630	0.383	1.496
Toluene	0.605	25.911	0.202	0.888
Other Octanes (C8's)	0.374	23.430	0.191	0.680
n-Octane	0.201	12.616	0.103	0.366
Ethylbenzene	0.127	6.352	0.049	0.216
m,p-Xylene	0.176	8.734	0.068	0.297
o-Xylene	0.035	1.716	0.013	0.058
Other Nonanes (C9's)	0.176	12.373	0.099	0.360
n-Nonane	0.095	6.662	0.053	0.194
Other Decanes (C10's)	0.146	11.320	0.089	0.331
n-Decane	0.042	3.234	0.026	0.094
Undecanes (C11)	0.021	1.617	0.013	0.047
<b>Totals</b>	<b>100.000</b>	<b>3242.1</b>	<b>29.179</b>	<b>100.000</b>

Specific Gravity            2.146  
Compressibility (Z)        0.959  
Molecular Weight            62.796

Saturated Ideal BTUs	3185.7	Saturated Real BTUs	3323.0
Dry Ideal BTUs	3242.1	Dry Real BTUs	3381.8



**TABLE A1**  
**SUMMARIES OF FLUID PROPERTIES ( 20°C & 14.7 PSIA )**

Description	Lab Method	Lab Result	Units of Measure
Gas-Oil Ratio,	0-Flash	-	SCF/STB
Molecular Weight	Cryette	306.3	gm/mol
Density	Anton-Paar	0.9090	gm/cc
STO Gravity	°API	24.0	°API
Water Content	ASTM D4377	0.17	wt%
BS&W	ASTM D4007	0.20	% (V/V)
Viscosity*	Cambridge	70.89	cP

\* Fluid viscosity was determined at the conditions of 71°F and 100 psig.

**TABLE A2**  
**COMPOSITIONAL ANALYSIS OF CLEANED STOCK TANK OIL**

Component Name	Chemical Symbol	Mole Fraction	Mass Fraction	Calculated Properties	
Nitrogen	N <sub>2</sub>	0.0000	0.0000	<b>Total Sample</b>	
Carbon Dioxide	CO <sub>2</sub>	0.0000	0.0000		
Hydrogen Sulphide	H <sub>2</sub> S	0.0000	0.0000	Molecular Weight	301.44
Methane	C <sub>1</sub>	0.0000	0.0000	Density (g/cc)	0.8936
Ethane	C <sub>2</sub>	0.0001	0.0000	<b>C<sub>6+</sub> Fraction</b>	
Propane	C <sub>3</sub>	0.0001	0.0000		
i-Butane	i-C <sub>4</sub>	0.0001	0.0000		
n-Butane	n-C <sub>4</sub>	0.0003	0.0001	Molecular Weight	302.20
i-Pentane	i-C <sub>5</sub>	0.0014	0.0003	Mole Fraction	0.9968
n-Pentane	n-C <sub>5</sub>	0.0013	0.0003	Density (g/cc)	0.8939
Hexanes	C <sub>6</sub>	0.0125	0.0036	<b>C<sub>7+</sub> Fraction</b>	
Heptanes	C <sub>7</sub>	0.0277	0.0092		
Octanes	C <sub>8</sub>	0.0480	0.0182		
Nonanes	C <sub>9</sub>	0.0594	0.0253	Molecular Weight	304.94
Decanes	C <sub>10</sub>	0.0566	0.0267	Mole Fraction	0.9842
Undecanes	C <sub>11</sub>	0.0591	0.0288	Density (g/cc)	0.8949
Dodecanes	C <sub>12</sub>	0.0522	0.0279	<b>C<sub>12+</sub> Fraction</b>	
Tridecanes	C <sub>13</sub>	0.0593	0.0344		
Tetradecanes	C <sub>14</sub>	0.0536	0.0338		
Pentadecanes	C <sub>15</sub>	0.0506	0.0346	Molecular Weight	364.75
Hexadecanes	C <sub>16</sub>	0.0420	0.0309	Mole Fraction	0.7334
Heptadecanes	C <sub>17</sub>	0.0410	0.0322	Density (g/cc)	0.9135
Octadecanes	C <sub>18</sub>	0.0395	0.0329	<b>C<sub>30+</sub> Fraction</b>	
Nonadecanes	C <sub>19</sub>	0.0356	0.0311		
Eicosanes	C <sub>20</sub>	0.0335	0.0305		
Heneicosanes	C <sub>21</sub>	0.0284	0.0274	Molecular Weight	826.24
Docosanes	C <sub>22</sub>	0.0259	0.0262	Mole Fraction	0.1443
Tricosanes	C <sub>23</sub>	0.0237	0.0250	Density (g/cc)	0.9995
Tetracosanes	C <sub>24</sub>	0.0212	0.0233	<b>C<sub>36+</sub> Fraction</b>	
Pentacosanes	C <sub>25</sub>	0.0195	0.0224		
Hexacosanes	C <sub>26</sub>	0.0178	0.0212		
Heptacosanes	C <sub>27</sub>	0.0163	0.0203	Molecular Weight	1083.19
Octacosanes	C <sub>28</sub>	0.0150	0.0194	Mole Fraction	0.0860
Nonacosanes	C <sub>29</sub>	0.0139	0.0186	Density (g/cc)	1.0280
Tricontanes	C <sub>30+</sub>	0.0125	0.0172		
Hentriacontanes	C <sub>31</sub>	0.0110	0.0156		
Dotriacontanes	C <sub>32</sub>	0.0102	0.0150		
Tritriacontanes	C <sub>33</sub>	0.0089	0.0136		
Tetratriacontanes	C <sub>34</sub>	0.0088	0.0138		
Pentatriacontanes	C <sub>35</sub>	0.0069	0.0111		
Hexatriacontanes plus	C <sub>36+</sub>	0.0860	0.3091		
		<b>1.0000</b>	<b>1.0000</b>		

Physical Properties calculated based on GPA 2145-00 physical constants

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Marathon Oil Corporation  
Rocky Mountain Operation  
1501 Stampede Avenue  
Cody, Wyoming 82414



May 20, 2016

Claudia Young Smith  
U.S. Environmental Protection Agency  
Region VIII, Air Quality Division  
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Dean Goggles  
Wind River Environmental Quality Commission  
P.O. Box 217  
Fort Washakie, WY 82514-0217

Certified Mail: 9407 1102 0088 2031 9437 18

RE: Federal NSR Program Synthetic Minor Application in Indian Country  
Wind River Indian Reservation, Fremont County, Wyoming  
Marathon Oil Corporation – Maverick Springs Tank Battery  
Replacement Pages for Incorrectly Printed Pages

Dear Ms Smith and Mr. Goggles,

Marathon Oil Company (Marathon) submitted a Federal New Source Review (NSR) Program application for a synthetic minor source permit to emit regulated air pollutants at the Maverick Springs Tank Battery pursuant to 40 CFR §49.153(a)(3) last week. The application was delivered to your office on Monday, May 16, 2016. This oil and gas production facility, located in Fremont County, Wyoming on the Wind River Indian Reservation, is subject to the Federal Implementation Plan under 40 CFR §49.151, Subpart C [See 40 CFR §49.153(c)].

While reviewing the submittal, it was determined that eight pages of the report containing figures did not print correctly and were truncated. These figures are being resubmitted as you instructed Donna Stevison today. Please find enclosed, the correctly printed figures identified below. The location for replacing each enclosed page in the application is shown below:

#### Section 3 Emissions Summary

- Table 3-1 Proposed Allowable Maximum Air Pollutant Emission Rates, Page 7
- Table 3-2 Uncontrolled PTE Maximum Air Pollutant Emission Rates, Page 8

#### Section 4 Compliance with Federal and Tribal NSR Synthetic Minor Permitting Requirements

- Table 4-1 Greenhouse Gas Emission Rates, Page 11

#### Appendix A Emission Calculations

- Maverick Tank Battery Physical Properties, Appendix A, Page 2;
- Maverick Springs Tank Battery FL-1 Hourly, Appendix A, Page 3;
- Maverick Springs Tank Battery FL-1 Annual, Appendix A, Page 5
- Maverick Springs Tank Battery, FL-1 Hourly PTE, Appendix A, Page 6
- Maverick Springs Tank Battery, FL-1 Annual PTE, Appendix A, Page 8

Marathon Oil Corporation  
Rocky Mountain Operation  
1501 Stampede Avenue  
Cody, Wyoming 82414



May 20, 2016

Claudia Young Smith  
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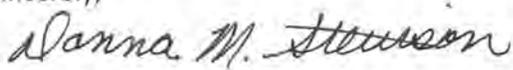
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- Maverick Springs Tank Battery, FL-1 Hourly PTE, Appendix A, Page 6
- Maverick Springs Tank Battery, FL-1 Annual PTE, Appendix A, Page 8

Page 2

If you have any questions concerning this information, please contact Donna Stevison at [dmstevison@marathonoil.com](mailto:dmstevison@marathonoil.com) or (307)527-2121.

Sincerely,



Donna M. Stevison  
Advanced HES Professional

Enclosures:    Table 3-1 Proposed Allowable Maximum Air Pollutant Emission Rates  
                    Table 3-2 Uncontrolled PTE Maximum Air Pollutant Emission Rates  
                    Table 4-1 Greenhouse Gas Emission Rates  
                    Maverick Springs Tank Battery Physical Properties  
                    Maverick Springs Tank Battery FL-1 Hourly  
                    Maverick Springs Tank Battery FL-1 Annual  
                    Maverick Springs Tank Battery, FL-1 Hourly PTE  
                    Maverick Springs Tank Battery, FL-1 Annual PTE

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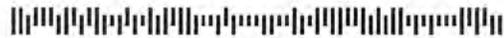
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Wind River Environmental Quality Commission  
Mr Dean Goggles  
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September 12, 2016

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Wind River Environmental Quality Commission  
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Fort Washakie, WY 82514

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RE: Chatterton Tank Battery Tribal Minor New Source Review Registration Application

Dear Ms. Smith,

Marathon Oil Company (Marathon), is submitting the enclosed Tribal Minor New Source Review (NSR) Registration to certify emissions at the Chatterton Tank Battery (Facility), located on the Wind River Indian Reservation in Wyoming.

The Facility is an existing Oil and Gas Production Facility, and will have an uncontrolled potential to emit (PTE) for regulated air pollutants below the major source thresholds as defined in 40 CFR §49.167 and §52.21, but a PTE for Volatile Organic Compounds (VOCs) and Hydrogen Sulfide (H<sub>2</sub>S) above the minor NSR thresholds as defined in Table 1 of 40 CFR §49.153. As such, the Facility requires a registration pursuant to 40 CFR §49, Subpart C, Section §49.160. The Facility has not been previously registered with EPA Region 8.

Marathon is submitting the enclosed Tribal Minor NSR Registration at this time due to an increase in the facility-wide PTE. In order to more accurately quantify emissions from the Facility, Marathon collected site-specific oil, produced water, and produced gas samples in June 2016. Laboratory analyses from site-specific samples have allowed Marathon to quantify emissions based off of a measured Gas-to-Oil Ratio (GOR), a measured Gas-to-Water Ratio (GWR), measured H<sub>2</sub>S concentrations, and a produced gas analysis. Previous PTE determinations were based off of representative oil analyses. The PTE represented in the enclosed registration reflects the maximum throughput capacity for the Facility.

Enclosed with this letter are the form REG, and all applicable components required for the Tribal Minor NSR Registration. If you have any questions regarding this submittal, please feel free to contact Donna Stevison at [dmstevison@marathonoil.com](mailto:dmstevison@marathonoil.com) or at (307) 254-2760.

Sincerely,



Jon F. Salomonsen  
Operations Manager

Enclosure: EPA Region 8 Tribal New Source Review Registration Application, Chatterton Tank Battery

Marathon Oil Company



**APPLICATION FOR EPA REGION 8  
TRIBAL MINOR NEW SOURCE  
REVIEW REGISTRATION**

Chatterton Tank Battery

Oil and Gas Production Facility

September 2016

FEDERAL NEW SOURCE REVIEW  
APPLICATION FOR TRIBAL MINOR  
NEW SOURCE REVIEW  
REGISTRATION

Marathon Oil Company

Oil and Gas Production Facility

Prepared for:

Marathon Oil Company (Marathon)

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Cody, WY 82414

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## APPENDICES

Appendix A: Emissions Calculations – Uncontrolled PTE Emissions

Appendix B: Emissions Calculations – Emissions Calculations – Actual Emissions

Appendix C: Tribal NSR Synthetic Minor Forms

Appendix D: Laboratory Analyses

## ACRONYMS AND ABBREVIATIONS

40 CFR	Title 40 of the United States Code of Federal Regulations
AP-42	EPA's AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition
bbf	Barrel
BOPY	Barrels of Oil per Year
BRE	Bryan Research & Engineering
BWPD	Barrels of Water per Day
CAA	Clean Air Act
DRE	Destruction and Removal Efficiency
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FIP	Federal Implementation Plan
GPM	Gallons per Minute
H <sub>2</sub> S	Hydrogen Sulfide
HAP	Hazardous Air Pollutant
lb	Pound
lb-mol	Pound-Mole
MACT	Maximum Achievable Control Technology
Marathon	Marathon Oil Company
MSS	Maintenance, Startup, and Shutdown
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NO <sub>x</sub>	Oxides of Nitrogen
NSPS	New Source Performance Standards
NSR	New Source Review
ppmv	Parts per Million by Volume
PSD	Federal Clean Air Act, Part C
psia	Pounds per Square Inch (absolute)
psig	Pounds per Square Inch (gauge)
RVP	Reid Vapor Pressure
SO <sub>2</sub>	Sulfur Dioxide
tpy	Tons per Year
VOC	Volatile Organic Compound

# 1 INTRODUCTION

Marathon Oil Company (Marathon) owns and operates the oil and gas production facility known as the Chatterton Tank Battery (Facility). The Facility is located in Fremont County, Wyoming on the Wind River Indian Reservation. The Facility is an oil and gas production facility subject to Federal Implementation Plan (FIP) for under 40 CFR §49.151, Subpart C [See 40 CFR §49.153(c)]. Further, Fremont County is designated as attainment/unclassifiable for all criteria pollutants. As such, the Facility is required to comply with the Clean Air Act (CAA) under the permitting authority of the Environmental Protection Agency (EPA) Region 8 Federal Minor New Source Review Program in Indian Country under 40 CFR §49, Subpart C.

Marathon respectfully submits this application for a Tribal NSR Registration in EPA Region 8 in accordance with 40 CFR §49.160 to emit regulated air pollutants. With the issuance of the requested registration, the Facility will have a potential to emit (PTE) for regulated air pollutants below the major source thresholds as defined in 40 CFR §49.167 and §52.21, but will have a PTE for Volatile Organic Compounds (VOCs) and Hydrogen Sulfide (H<sub>2</sub>S) air pollutants above the minor NSR thresholds as defined in Table 1 of 40 CFR §49.153. The Facility is an oil and gas production facility. Therefore, it is not a listed source category under 40 CFR §52.21(b)(1) and would be considered a major source if the PTE of any criteria pollutant is greater than or equal to 250 tons per year (tpy). As summarized in Table 3-1, the PTE, calculated as defined in 40 CFR §49.152 and 40 CFR §52.21(b)(1) for non-named sources, for each criteria pollutant is less than 250 tpy. Federal major new source review and prevention of significant deterioration (PSD) review are not triggered.

Additionally, Title V permitting requirements will not be triggered since the Title V major source thresholds, as defined in 40 CFR §71.2, are not exceeded: 100 tpy for each criteria pollutant, 25 tpy for total hazardous air pollutants (HAPs), 10 tpy for any single HAP.

This report includes all required elements for a Tribal NSR Registration application defined in 40 CFR §49.160. As applicable, this information is provided on the required Tribal NSR Registration application materials including the FORM REG, provided in Appendix C.

## 2 PROCESS DESCRIPTION AND PROCESS FLOW DIAGRAM

The Chatterton Tank Battery will operate 24 hours a day, 7 days a week, and 52 weeks a year, for a total annual hours of 8,760. The Facility is requesting to handle up to 350-bbl per day of crude oil (BOPD), and 44,141-bbl per day of produced water (BWPD).

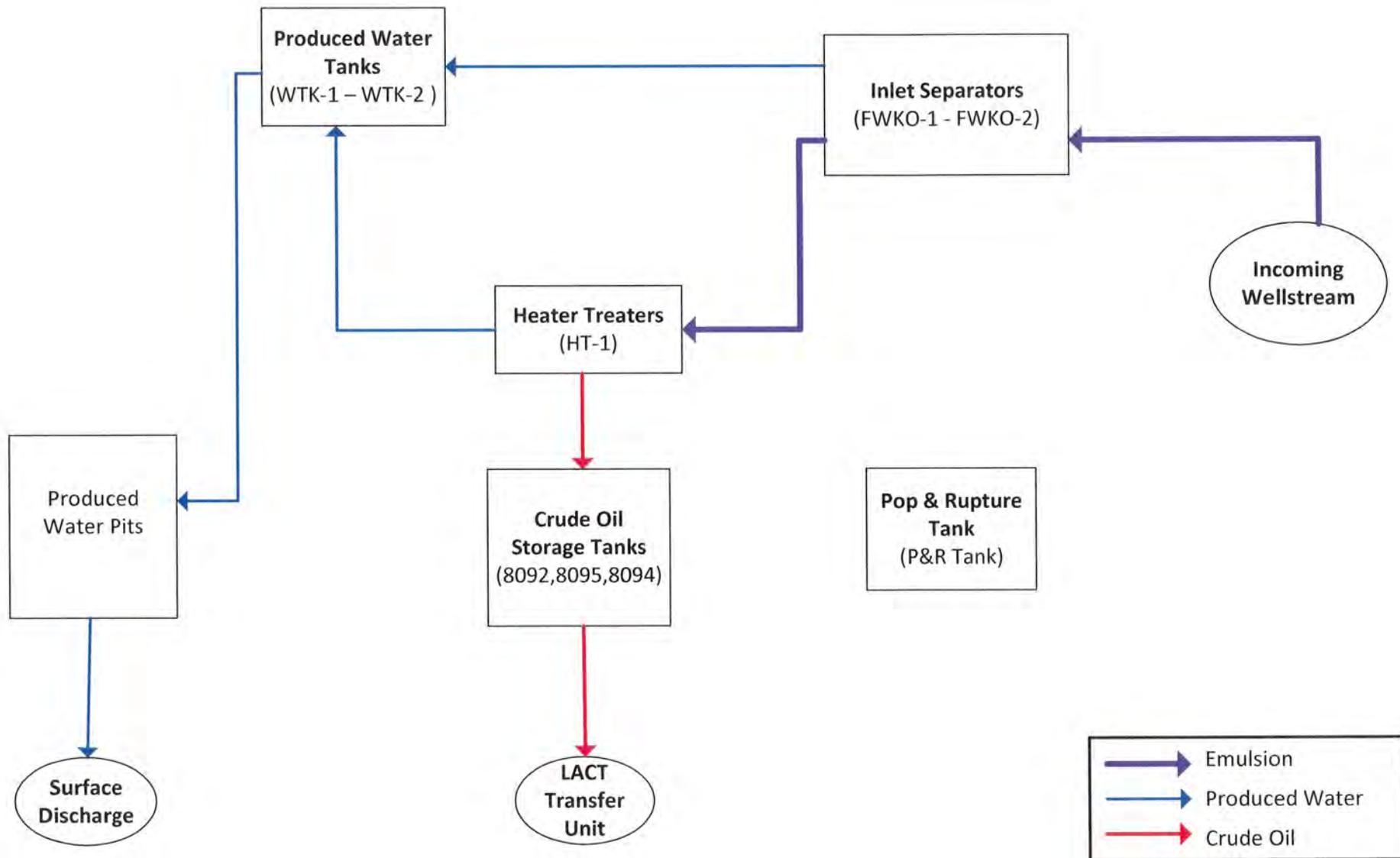
Production from the wells enters the Chatterton Tank Battery through two inlet free water knockouts (FWKO). From the FWKOs, the oil/gas emulsion is sent to a heater treater (HT-1) for secondary separation of the gas, oil and produced water. The produced water that is separated from the FWKOs and the heater treater, is then routed to two 1,000-bbl produced water tanks (WTK-1 & WTK-2). Vapors from the tanks are vented to atmosphere. After the produced water enters the tank, it is sent to two open water pits, where it is released via surface water discharge.

Produced gas that is flashed off of the heater treater is vented to atmosphere. Oil that is separated out of the heater treater is sent to a 300 barrel (bbl) crude oil run tank (Sales Tank 8092) before it is routed to a lease-activated custody transfer (LACT) Unit, and then to the sales pipeline. During non-normal operating conditions, reject or overflow oil will be directed to either an electrically heated 300-bbl reject oil tank (Reject Tank 8094), or a 300-bbl overflow (Overflow Tank 8095) tank. The overflow tank is used for maintenance and upset conditions, and the heated reject oil tank is used for the storage & recycling of oil that cannot be sent to sales. During upset operating events, a 2,000-bbl pop and rupture tank (P&R Tank) will be used to store liquids from the FWKOs. Vapors from the crude oil run tank and all other storage tanks are vented to atmosphere.

The produced gas from the Facility contains up to 52,700 parts per million (ppm) H<sub>2</sub>S. A process flow diagram for the Facility is provided in Figure 2-1. A summary of the equipment at the Facility is presented in Table 2-1.

Table 2-1. Summary of Equipment

Equipment ID	Equipment Description	Capacity/Design Rate	Controls
FUG-1	Fugitive Emissions	N/A	None
Sales Tank 8092	Crude Oil Sales Tank	300 bbl	None
Overflow Tank 8095	Crude Oil Overflow Tank	300 bbl	None
Reject Tank 8094	Crude Oil Reject Tank	300 bbl	None
WTK-1	Produced Water Tank	1,000 bbl	None
WTK-2	Produced Water Tank	1,000 bbl	None
P&R Tank	Pop & Rupture Tank	2,000 bbl	None
HT-1	Heater Treater Produced Gas	N/A	None
B-1	Heater Treater Burner	1 MMBTU/hr	None
MSS-DEGAS	Tank Degassing	N/A	None



## 3 EMISSIONS SUMMARY

The maximum uncontrolled PTE air pollutant emission rates proposed for each emission source at the Facility are presented in Table 3-1, and the actual air pollutant emission rates, based off of 2015 production data, are presented in Table 3-2. Detailed emission calculations for the proposed equipment and operations are presented in Appendix A for the PTE and Appendix B for actual 2015 production.

### 3.1 Emissions Calculations

Emissions of Volatile Organic Compounds (VOCs) from material phase changes such as flashing, and tank losses were calculated using the ProMax Process Simulator published by Bryan Research and Engineering (BRE). The process simulator emission calculation tables are provided in Appendix A for the PTE and Appendix B for actual 2015 production.

#### 3.1.1 Gas and Liquid Analyses

The composition and physical properties of the crude oil were taken from an extended lab analysis of oil that was collected from the outlet of the heater treater. The produced gas properties were taken from a produced gas sample, as well as oil and produced water flash liberation analyses, which were collected at the storage tanks. Laboratory analyses are provided in Appendix D.

#### 3.1.2 Storage Tank Emissions

Emissions of volatile organic compounds (VOC), H<sub>2</sub>S, and hazardous air pollutants (HAP) from the oil and water storage tanks were estimated using BRE ProMax Process Simulator (ProMax). This model accounts for flash emissions resulting from the change in liquid stream pressure from the separator to ambient conditions and the working and breathing losses. The emissions are based on the maximum annual capacity production rates for oil and water, design operating pressure and temperature of separators, and the material analyses as discussed in Section 3.1.1. Some flashing emissions from the crude oil and produced gas were accounted for at the heater treater (HT-1), and will vent to atmosphere. Working, breathing, and additional flashing emissions from the produced water and crude oil tanks are based on the maximum storage tank liquid surface temperature obtained from AP-42, Chapter 7.1 for Cheyenne, Wyoming. Emissions from the two 1,000-bbl produced water tanks (WTK-1 & WTK-2) are not controlled and vent to atmosphere.

All crude oil that is routed to the sales pipeline flows through the 300-bbl crude oil run tank (Sales Tank 8092). The 300-bbl reject tank (Reject Tank 8094) and 300-bbl overflow tank (Overflow Tank 8095) are not used during normal operating conditions. Volumes of oil sent to the overflow, and reject tanks represent maximum actual volumes for an entire year. Emissions from crude oil storage tanks are not controlled, and will vent to atmosphere. During upset conditions, a 2,000-bbl pop and rupture tank (P&R Tank) will be used to store liquids from the FWKOs. Emissions for the pop and rupture tank assume one upset event per year.

Detailed process streams provided by ProMax, and emission calculations are presented in Appendix A for the PTE, and Appendix B for actual 2015 production.

### **3.1.3 Fugitive Emissions**

Fugitive emissions (FUG-1) from equipment leaks are estimated using emission factors for oil and gas production facilities from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4. No control efficiency is applied to the emissions. Total fugitive component counts are based on equipment counts at the Facility and default average component counts for major natural gas production equipment (40 CFR Part 98, Subpart W, Table W-1B) and for major crude oil production equipment (40 CFR Part 98, Subpart W, Table W-1C).

### **3.1.4 External Combustion Unit Emissions**

The heater treater burner (B-1) at the Facility is fueled by propane. Emissions from the heater treater were estimated using emission factors from USEPA AP-42 Chapter 1.5 Liquefied Petroleum Gas (LPG) Combustion, dated July 2008 for small boilers, the maximum design heat input rating, and annual hours of operation. Total annual propane usage for the heater will be 95,738 gallons.

### **3.1.5 Greenhouse Gas Emissions**

Greenhouse Gas (GHG) emissions from the storage tanks at the Facility were calculated for carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) from mass balances. GHG emissions from the external combustion units were estimated using GHG factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion. Equivalent carbon dioxide emissions (CO<sub>2</sub>e) were estimated based on individual GHG emissions and the Global Warming Potentials (GWP) provided in 40 CFR Part 98, Subpart A, Table A-1.

## **3.2 Maintenance, Startup and Shutdown (MSS)**

In addition to the normal operation emission sources, Marathon is requesting to include the following planned MSS operations into the total annual emissions for the Facility:

- Tank Vent Degassing (MSS-DEGAS);

Tank Vent Degassing Losses were estimated for each of the storage tanks at the Facility, and the emissions are uncontrolled. Crude oil tanks are cleaned once per year assuming each tank takes one hour to clean. The Produced water tank is also cleaned once per year, assuming the tank takes twelve hours to clean. Tanks operate at atmospheric conditions. Degassing emissions are based on the ideal gas law.



Marathon Oil , LLC  
 Chatterton Tank Battery  
 Emissions Summary

Table 3-1. Uncontrolled PTE Maximum Air

Emission Source	Benzene		HAP	
	lbs/hr	tpy	lbs/hr	tpy
Fugitive Emissions	1.46E-03	6.40E-03	0.15	0.66
Crude Oil Sales Tank	1.77E-04	1.39E-04	0.02	0.02
Crude Oil Overflow Tank	1.54E-05	6.74E-05	0.02	0.01
Crude Oil Reject Tank	1.54E-05	6.74E-05	1.90E-03	0.01
Produced Water Tank	1.69E-03	2.27E-03	0.02	0.04
Produced Water Tank	1.69E-03	2.27E-03	0.02	0.04
Pop & Rupture Tank	5.89E-04	2.58E-03	0.07	0.29
Heater Treater Produced Gas	2.49E-03	0.01	0.25	1.08
Heater Treater Burner	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Tank Degassing	1.20E-04	6.01E-08	0.01	7.43E-06
	0.01	0.02	0.55	2.15
MAXIMUM Year		8760		



Marathon Oil , LLC  
 Chatterton Tank Battery  
 Emissions Summary

Table 3-2. Actual Pollutant Emission Rates

Emission Source	Benzene		HAP	
	lbs/hr	tpy	lbs/hr	tpy
Fugitive Emissions	1.42E-03	6.23E-03	0.13	0.59
Crude Oil Sales Tank	9.40E-05	1.69E-04	0.01	0.02
Crude Oil Overflow Tank	1.60E-05	7.01E-05	0.02	0.01
Crude Oil Reject Tank	1.60E-05	7.01E-05	1.81E-03	0.01
Produced Water Tank # 1	1.67E-03	2.25E-03	0.02	0.04
Produced Water Tank # 2	1.67E-03	2.25E-03	0.02	0.04
Pop & Rupture Tank	5.89E-04	2.58E-03	0.07	0.29
Heater Treater Produced Gas	2.30E-03	0.01	0.21	0.91
Heater Treater Burner	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Tank Degassing	1.27E-04	6.36E-08	0.01	7.18E-06
	<b>0.01</b>	<b>0.02</b>	<b>0.48</b>	<b>1.90</b>
MAXIMUM Year		8760		

## 4 COMPLIANCE WITH FEDERAL PERMITTING REQUIREMENTS

A summary of compliance with applicable federal requirements, including applicable NSPS regulations is provided in Tables 4-1.

Table 4-1. Federal Standard Applicability

Federal Standard	Name	Applicability
<b>NSPS</b>		
NSPS OOOOa	Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution	<p>This subpart establishes standards for emission sources at oil and gas production facilities that were constructed on or after September 18, 2015.</p> <p><i>The produced water storage vessels (WTK-1 &amp; WTK-2) at the Facility were constructed after September 18, 2015, however, the annual PTE of WTK-1 &amp; WTK-2 is less than 6 tpy. Therefore the produced water storage vessels do not meet the applicability provisions of 40 CFR §60.5365a, and are not subject to the requirements of NSPS OOOOa.</i></p> <p><i>All other storage tanks (Sales Tank 8092, Overflow Tank 8095, Reject Tank 8094 &amp; P&amp;R Tank) were constructed prior to August 23, 2011 and have an annual PTE less than 6 tpy, therefore do not meet the applicability provisions of 40 CFR §60.5365. NSPS OOOO is not applicable.</i></p>
NSPS Kb	Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984	<p>This subpart applies to storage vessels containing volatile organic liquids with either a capacity greater than 75 m<sup>3</sup> (470 bbl) with a maximum true vapor greater than 76.6 kPa (11.1 psi) or greater than 151 m<sup>3</sup> (950 bbl) with a maximum true vapor pressure greater than 3.5 kPa (0.5 psi).</p> <p><i>The Facility is exempt from the requirements of NSPS Kb under exemption §60.110b (d)(4) for vessels with a design capacity <u>less than or equal</u> to 1,589.874 m<sup>3</sup> used for petroleum or condensate stored, processed, or treated prior to custody transfer. NSPS Kb is not applicable.</i></p>

# APPENDIX A

Emissions Calculations – Uncontrolled PTE Emissions



Marathon Oil , LLC  
 Chatterton Tank Battery  
 Facility Information

<b>Oil and Gas Site General Information</b>	
<b>Administrative Information</b>	
Company Name	Marathon Oil , LLC
Facility/Well Name	Chatterton Tank Battery
Nearest City/Town	Riverton
County	Fremont

<b>Technical Information</b>	
Produced Gas Site Throughput (MMSCF/day):	0.06
Produced Gas Site Throughput (MMSCF/year):	21.26
Oil/Condensate Site Throughput (bbl/day):	350
Oil/Condensate Site Throughput (bbl/year):	127,750
Produced Water Site Throughput (bbl/day):	44,141
Produced Water Site Throughput (bbl/year):	16,111,465
Are there any sour gas streams at this site?	Yes
Gas H2S Concentration (ppm)	88,573
Has this site been registered before?	Yes

<b>Equipment/Process Types</b>	<b>How many for this project?</b>
Fugitives	NO
IC Engines	0
Turbines	0
Compressors (electric)	0
Diesel Engines	0
Heaters-Boilers	1
Separators	2
Oil / Condensate Tanks	1
Produced Water Tanks	1
Miscellaneous Tanks	2
Loading Jobs	0
Glycol Units	0
Amine Units	0
Vapor Recovery Units	0
Flares-Vapor Combustors	0
Thermal Oxidizers	0
MSS	YES



**Marathon Oil, LLC  
Chatterton Tank Battery  
Fugitive Emissions**

**Background Information**

Total fugitive component counts are based on equipment counts at the facility and default average component counts for major crude oil production equipment (40 CFR Part 98, Subpart W, Table W-1C) and major onshore natural gas production equipment (40 CFR Part 98, Subpart W, Table W-1B). Since both light oil and gas components are present at the facility, the emissions assume the maximum component emission factor.

**Component Count for Oil Production**

Major equipment	Valves	Flanges	Connectors	Open-ended lines	Other components
Wellhead	5	10	4	0	1
Separator	6	12	10	0	0
Meters/piping	0	0	0	0	0
Heater-treater	8	12	20	0	0
Header	5	10	4	0	0
In-line heaters	0	0	0	0	0
Dehydrators	0	0	0	0	0
Compressors	0	0	0	0	0

**Component Count for Gas Production (Western US)**

Major equipment	Valves	Flanges	Connectors	Open-ended lines	Other components
Wellhead	11	0	36	1	0
Separators	34	0	106	6	2
Meters/piping	14	0	51	1	1
Heater-treater	0	0	0	0	0
Header	0	0	0	0	0
In-line heaters	14	0	65	2	1
Dehydrators	24	0	90	2	2
Compressors	73	0	179	3	4

**Facility Equipment Counts**

Major equipment	Gas Production	Oil Production
Wellhead	0	0
Separator	2	2
Meters/piping	1	2
Heater-treater	N/A	1
Header	1	1
In-line heaters	0	N/A
Dehydrators	0	N/A
Compressors	0	N/A

Component Service	Component Counts - MRR Approach				
	Valve	Flanges	Connectors	Open-Ended Line	Other Components
Gas Service	82	0	263	13	5
Light Oil Service	25	46	44	0	0

**Emissions Estimate**

Liquid Equipment/Service	Oil and Gas Production Operations Emission Factor <sup>a</sup> (Light Oil)	Oil and Gas Production Operations Emission Factor <sup>a</sup> (Gas)	# Light Oil Components	# Gas Components	Short-Term TOC Emissions <sup>b</sup>	Annual TOC Emissions <sup>c</sup>
	(lb TOC/hr/component)	(lb TOC/hr/component)			(lb/hr)	(ton/yr)
Valves	0.0055	0.00992	25	82	0.95	4.17
Flanges	0.000243	0.00086	46	0	0.01	0.05
Open-Ended Lines	0.00309	0.00441	0	13	0.06	0.25
Connectors	0.000463	0.00044	44	263	0.14	0.60
Other	0.0165	0.0194	0	5	0.10	0.42
<b>Total</b>					<b>1.25</b>	<b>5.49</b>

<sup>a</sup> Emission factors are for oil and gas production facilities (not refineries) come from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4.

<sup>b</sup> Controlled Short-Term ER (lb/hr) = (100% - Reduction Factor) \* Σ(Number of Components \* Emissions Factor [lb/hr/component])

<sup>c</sup> Controlled Annual ER (tpy) = Controlled Short-Term ER (lb/hr) \* 8,760 (hr/yr) / 2,000 (lb/ton)

<sup>d</sup> No reduction from LDAR monitoring is being claimed.

Marathon Oil, LLC  
Chatterton Tank Battery  
Fugitive Emissions

Speciated Fugitive Emissions<sup>a</sup>

Component	Light Oil (lb/hr)	Light Oil (ton/year)	Gas (lb/hr)	Gas (ton/year)	Total (lb/hr)	Total (ton/year)
Nitrogen	0.08	0.34	3.07	13.46	3.15	13.79
CO <sub>2</sub>	1.32	5.76	3.85	16.86	5.17	22.62
Methane	0.26	1.16	2.05	8.97	2.31	10.12
Ethane	0.07	0.32	0.14	0.63	0.22	0.95
Propane	0.05	0.21	0.15	0.64	0.19	0.85
Isobutane	0.01	0.06	0.06	0.25	0.07	0.31
n-Butane	0.03	0.13	0.13	0.55	0.16	0.68
Isopentane	0.01	0.04	0.04	0.18	0.05	0.22
n-Pentane	0.01	0.03	0.05	0.20	0.05	0.23
i-C6	0.02	0.09	0.14	0.63	0.16	0.72
n-Hexane	0.02	0.07	0.12	0.54	0.14	0.62
Benzene	1.41E-04	6.17E-04	1.32E-03	0.01	1.46E-03	0.01
Cyclohexane	7.01E-04	3.07E-03	0.01	0.02	0.01	0.03
i-C7	3.81E-03	0.02	0.12	0.53	0.12	0.54
n-Heptane	--	--	--	--	--	--
Toluene	2.70E-04	1.18E-03	3.09E-03	0.01	3.36E-03	0.01
2,2,4-Trimethylpentane	2.23E-07	9.78E-07	2.10E-06	9.21E-06	2.33E-06	1.02E-05
n-Octane	0.02	0.07	0.21	0.92	0.22	0.98
Ethylbenzene	3.24E-04	1.42E-03	4.45E-03	0.02	4.77E-03	0.02
m-Xylene	1.86E-05	8.13E-05	1.94E-04	8.49E-04	2.12E-04	9.31E-04
3-Methyloctane	--	--	--	--	--	--
n-Nonane	3.00E-03	0.01	0.06	0.25	0.06	0.26
H <sub>2</sub> S	0.72	3.15	1.61	7.04	2.33	10.19
Water	4.71E-05	2.06E-04	0.21	0.91	0.21	0.91
ClO <sup>+</sup>	2.25E-07	9.87E-07	1.33E-04	0.04	1.33E-04	0.04
<b>Total</b>	<b>2.62</b>	<b>11.46</b>	<b>12.01</b>	<b>52.64</b>	<b>14.63</b>	<b>64.10</b>
<b>TOC</b>	<b>0.51</b>	<b>2.22</b>	<b>3.27</b>	<b>14.38</b>	<b>3.78</b>	<b>16.59</b>
<b>VOC</b>	<b>0.17</b>	<b>0.74</b>	<b>1.08</b>	<b>4.78</b>	<b>1.25</b>	<b>5.52</b>
<b>Total HAP</b>	<b>0.02</b>	<b>0.08</b>	<b>0.13</b>	<b>0.58</b>	<b>0.15</b>	<b>0.66</b>

<sup>a</sup> Fugitive oil emissions speciation is based on the crude oil tank W&B vapors. Fugitive gas emissions speciation is based on sales gas stream.

Marathon Oil , LLC  
 Chatterton Tank Battery  
 Heater Treater Produced Gas

Identification		
Emission Source		HT-1
Produced Gas Throughput (MMscfd)		0.0457
Produced Gas Throughput (MMscf/yr)		16.68
Heater Treater Operating Parameters*		
Temperature (F)		155.0
Pressure (psig)		10.0

Notes

\* From ProMax AP-42 Emissions Report.

**Speciated Produced Gas Emissions -HT-1**

Component	Heater Treater Produced Gas	
	Produced Gas (lb/hr)	Produced Gas (tpy)
Nitrogen	70.26	307.72
CO2	28.88	126.51
Methane	24.17	105.88
Ethane	0.81	3.55
Propane	0.58	2.55
Isobutane	0.18	0.80
n-Butane	0.38	1.65
Isopentane	0.10	0.46
n-Pentane	0.11	0.47
i-C6	0.29	1.28
n-Hexane	0.23	1.02
Benzene	2.49E-03	0.01
Cyclohexane	0.01	0.04
i-C7	0.20	0.87
n-Heptane	--	--
Toluene	4.71E-03	0.02
2,2,4-Trimethylpentane	3.43E-06	1.50E-05
n-Octane	0.27	1.18
Ethylbenzene	0.01	0.02
m-Xylene	2.43E-04	1.06E-03
3-Methyloctane	--	--
n-Nonane	0.06	0.27
H2S	7.32	32.08
Water	1.20	5.24
C10+	3.97E-05	1.74E-04
<b>Total</b>	<b>135.07</b>	<b>591.62</b>
<b>Total CO2</b>	<b>28.88</b>	<b>126.51</b>
<b>Total Methane</b>	<b>24.17</b>	<b>105.88</b>
<b>Total CO<sub>2</sub>e</b>	<b>633.20</b>	<b>2,773.40</b>
<b>Total VOC</b>	<b>2.43</b>	<b>10.66</b>
<b>Total HAP</b>	<b>0.25</b>	<b>1.08</b>

Marathon Oil, LLC  
Chatterton Tank Battery  
Crude Oil Sales Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source	Sales Tank 8092	
Throughput (BPD)	350.00	
Throughput (BPY)	127,750	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	469.73	
Net Throughput (gal/yr)	5,365,500	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	8.14	
Total Uncontrolled Tank VOC Emissions		
VOC Flashing Losses (ton/yr) <sup>c</sup>	0.02	
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	0.14	
Total VOC Losses (ton/yr) <sup>c</sup>	0.16	

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Crude Oil Sales Tank Emissions

Component	Crude Oil Sales Tank- 300 BBL			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	0.01	0.19	0.06	0.27
CO2	0.25	0.49	1.09	0.28
Methane	0.05	0.21	0.22	0.18
Ethane	0.01	0.02	0.06	0.01
Propane	0.01	0.02	0.04	0.01
Isobutane	2.72E-03	0.01	0.01	2.04E-03
n-Butane	0.01	0.02	0.02	4.16E-03
Isopentane	1.52E-03	0.01	0.01	1.07E-03
n-Pentane	1.51E-03	0.01	0.01	1.06E-03
i-C6	3.94E-03	0.02	0.02	2.72E-03
n-Hexane	3.15E-03	0.01	0.01	2.06E-03
Benzene	2.66E-05	1.50E-04	1.17E-04	2.21E-05
Cyclohexane	1.33E-04	5.82E-04	5.80E-04	8.32E-05
i-C7	7.20E-04	0.01	3.16E-03	1.63E-03
n-Heptane	--	--	--	--
Toluene	5.10E-05	3.16E-04	2.24E-04	3.71E-05
2,2,4-Trimethylpentane	4.22E-08	2.22E-07	1.85E-07	2.77E-08
n-Octane	2.88E-03	0.02	0.01	1.88E-03
Ethylbenzene	6.13E-05	4.14E-04	2.68E-04	3.92E-05
m-Xylene	3.51E-06	1.79E-05	1.54E-05	1.68E-06
3-Methyloctane	--	--	--	--
n-Nonane	5.68E-04	4.83E-03	2.49E-03	3.71E-04
H2S	0.14	0.24	0.59	0.09
Water	8.90E-06	0.03	3.90E-05	0.01
C10+	4.26E-08	3.99E-06	1.86E-07	3.18E-08
<b>Total</b>	<b>0.49</b>	<b>1.31</b>	<b>2.16</b>	<b>0.85</b>
<b>Total CO2</b>	<b>0.25</b>	<b>0.49</b>	<b>1.09</b>	<b>0.28</b>
<b>Total Methane</b>	<b>0.05</b>	<b>0.21</b>	<b>0.22</b>	<b>0.18</b>
<b>Total CO<sub>2</sub>e</b>	<b>1.49</b>	<b>5.71</b>	<b>6.55</b>	<b>4.67</b>
<b>Total VOC</b>	<b>0.03</b>	<b>0.13</b>	<b>0.14</b>	<b>0.02</b>
<b>Total HAP</b>	<b>3.30E-03</b>	<b>0.01</b>	<b>0.01</b>	<b>2.16E-03</b>

Marathon Oil, LLC  
 Chatterton Tank Battery  
 Crude Oil Overflow Tank

Identification - Vertical Fixed Roof Tanks		
	Emission Source	Overflow Tank 8095
	Throughput (BPD)	5.00
	Throughput (BPY)	1,825
Tank Dimensions		
	Shell Height (ft)	15.0
	Diameter (ft)	12.0
	Volume (gal)	12,690
	Turnovers <sup>a</sup>	6.71
	Net Throughput (gal/yr)	76,650
Other Inputs		
	Shell & Roof Color/Shade <sup>b</sup>	Tan
	Shell & Roof Condition	Good
	Meteorological Data	Cheyenne, WY
Tank Contents		
	Crude RVP <sup>c</sup>	8.14
Total Uncontrolled Tank VOC Emissions		
	VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	0.08

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Crude Oil Overflow Tank Emissions

Component	Crude Oil Overflow Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	1.81E-03	0.01
CO2	0.02	0.09
Methane	4.61E-03	0.02
Ethane	1.76E-03	0.01
Propane	0.01	0.02
Isobutane	1.57E-03	0.01
n-Butane	3.22E-03	0.01
Isopentane	8.79E-04	3.85E-03
n-Pentane	8.71E-04	3.81E-03
i-C6	2.28E-03	0.01
n-Hexane	1.82E-03	0.01
Benzene	1.54E-05	6.74E-05
Cyclohexane	7.66E-05	3.35E-04
i-C7	4.16E-04	1.82E-03
n-Heptane	--	--
Toluene	2.95E-05	1.29E-04
2,2,4-Trimethylpentane	2.44E-08	1.07E-07
n-Octane	1.66E-03	0.01
Ethylbenzene	3.54E-05	1.55E-04
m-Xylene	2.03E-06	8.88E-06
3-Methyloctane	--	--
n-Nonane	3.28E-04	1.44E-03
H2S	0.04	0.16
Water	5.14E-06	2.25E-05
C10+	2.46E-08	1.08E-07
<b>Total</b>	<b>0.09</b>	<b>0.37</b>
<b>Total CO2</b>	<b>0.02</b>	<b>0.09</b>
<b>Total Methane</b>	<b>4.61E-03</b>	<b>0.02</b>
<b>Total CO2e</b>	<b>0.14</b>	<b>0.60</b>
<b>Total VOC</b>	<b>0.02</b>	<b>0.08</b>
<b>Total HAP</b>	<b>1.90E-03</b>	<b>0.01</b>

Marathon Oil, LLC  
 Chatterton Tank Battery  
 Crude Reject Oil Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source		Reject Tank 8094
Throughput (BPD)		5.00
Throughput (BPY)		1,825
Tank Dimensions		
Shell Height (ft)		15.0
Diameter (ft)		12.0
Volume (gal)		12,690
Turnovers <sup>a</sup>		6.71
Net Throughput (gal/yr)		76,650
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>		Tan
Shell & Roof Condition		Good
Meteorological Data		Cheyenne, WY
Tank Contents		
Crude RVP <sup>c</sup>		8.14
Water		
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>		0.08

Notes  
<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report

**Speciated Crude Oil Reject Tank Emissions**

Component	Crude Oil Reject Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	1.81E-03	0.01
CO2	0.02	0.09
Methane	4.61E-03	0.02
Ethane	1.76E-03	0.01
Propane	0.01	0.02
Isobutane	1.57E-03	0.01
n-Butane	3.22E-03	0.01
Isopentane	8.79E-04	3.85E-03
n-Pentane	8.71E-04	3.81E-03
i-C6	2.28E-03	0.01
n-Hexane	1.82E-03	0.01
Benzene	1.54E-05	6.74E-05
Cyclohexane	7.66E-05	3.35E-04
i-C7	4.16E-04	1.82E-03
n-Heptane	--	--
Toluene	2.95E-05	1.29E-04
2,2,4-Trimethylpentane	2.44E-08	1.07E-07
n-Octane	1.66E-03	0.01
Ethylbenzene	3.54E-05	1.55E-04
m-Xylene	2.03E-06	8.88E-06
3-Methyloctane	--	--
n-Nonane	3.28E-04	1.44E-03
H2S	0.04	0.16
Water	5.14E-06	2.25E-05
C10+	2.46E-08	1.08E-07
<b>Total</b>	<b>0.09</b>	<b>0.37</b>
<b>Total CO2</b>	<b>0.02</b>	<b>0.09</b>
<b>Total Methane</b>	<b>4.61E-03</b>	<b>0.02</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.14</b>	<b>0.60</b>
<b>Total VOC</b>	<b>0.02</b>	<b>0.08</b>
<b>Total HAP</b>	<b>1.90E-03</b>	<b>0.01</b>

Marathon Oil, LLC  
 Chatterton Tank Battery  
 Produced Water Tanks

Identification - Vertical Fixed Roof Tanks		
Emission Source	WTK-1 & WTK-2	
Throughput (BPD)	44,141.00	
Throughput (BPY)	16,111,465	
Tank Dimensions		
Shell Height (ft)	30.0	
Diameter (ft)	15.5	
Volume (gal)	41,500	
Turnovers <sup>a</sup>	17,753.76	
Net Throughput (gal/yr)	676,681,530	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	8.14	
Water (Mol %)	99.97%	
Total Uncontrolled Tank VOC Emissions (each)		
VOC Flashing Losses (ton/yr) <sup>c</sup>	0.83	
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	2.15E-04	
Total VOC Losses (ton/yr) <sup>c</sup>	0.83	

Notes  
<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report

**Speciated Produced Water Skin Emissions -WTK-1 & WTK-2**

Component	Produced Water Tanks-1,000 BBL (each)			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	0.01	14.05	0.04	52.65
CO2	1.53	38.93	6.72	70.85
Methane	0.02	8.71	0.08	29.15
Ethane	9.59E-04	0.38	4.20E-03	1.10
Propane	8.03E-05	0.20	3.52E-04	0.64
Isobutane	4.69E-06	0.05	2.05E-05	0.15
n-Butane	1.04E-05	0.12	4.56E-05	0.39
Isopentane	5.48E-07	0.02	2.40E-06	0.08
n-Pentane	4.75E-08	0.01	2.08E-07	0.05
i-C6	1.15E-07	0.04	5.03E-07	0.15
n-Hexane	1.13E-08	0.02	4.95E-08	0.07
Benzene	1.24E-06	3.38E-03	5.43E-06	4.54E-03
Cyclohexane	9.22E-09	0.01	4.04E-07	0.01
i-C7	2.90E-09	0.02	1.27E-08	0.07
n-Heptane	--	--	--	--
Toluene	4.80E-07	0.01	2.10E-06	0.01
2,2,4-Trimethylpentane	1.21E-13	2.54E-07	5.30E-13	9.30E-07
n-Octane	4.33E-11	0.01	1.90E-10	0.02
Ethylbenzene	1.58E-07	0.01	6.92E-07	0.01
m-Xylene	5.32E-09	2.96E-04	2.33E-08	4.18E-04
3-Methyloctane	--	--	--	--
n-Nonane	3.85E-12	1.20E-03	1.69E-11	0.01
H2S	0.38	10.76	1.66	18.14
Water	--	--	--	1.87
C10+	4.99E-17	1.35E-05	2.19E-16	1.05E-05
<b>Total</b>	<b>1.94</b>	<b>73.34</b>	<b>8.51</b>	<b>175.42</b>
<b>Total CO2</b>	<b>1.53</b>	<b>38.93</b>	<b>6.72</b>	<b>70.85</b>
<b>Total Methane</b>	<b>0.02</b>	<b>8.71</b>	<b>0.08</b>	<b>29.15</b>
<b>Total CO2e</b>	<b>2.01</b>	<b>256.60</b>	<b>8.82</b>	<b>799.59</b>
<b>Total VOC</b>	<b>9.81E-05</b>	<b>0.51</b>	<b>4.30E-04</b>	<b>1.66</b>
<b>Total HAP</b>	<b>1.90E-06</b>	<b>0.03</b>	<b>8.30E-06</b>	<b>0.09</b>

Marathon Oil, LLC  
Chatterton Tank Battery  
Pop & Rupture Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source		P&R Tank
Throughput (BPY)		1,072
Tank Dimensions		
Shell Height (ft)		24.0
Diameter (ft)		25.0
Volume (gal)		88,128
Turnovers <sup>a</sup>		0.57
Net Throughput (gal/yr)		45,024
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>		Tan
Shell & Roof Condition		Fair
Meteorological Data		Cheyenne, WY
Tank Contents		
Crude RVP <sup>c</sup>		8.14
Total Uncontrolled Tank VOC Emissions		
VOC Flashing Losses (ton/yr) <sup>c</sup>		0.01
VOC Working & Breathing Losses (ton/yr) <sup>e</sup>		1.34
Total VOC Losses (ton/yr) <sup>f</sup>		1.35

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Pop & Rupture Tank Emissions

Component	Pop & Rupture Tank- 2000 BBL			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	1.13E-03	0.01	4.93E-03	0.07
CO2	0.01	0.01	0.05	0.07
Methane	2.37E-03	0.01	0.01	0.04
Ethane	1.07E-03	4.15E-04	4.67E-03	2.38E-03
Propane	4.04E-03	4.29E-04	0.02	2.10E-03
Isobutane	3.23E-03	1.30E-04	0.01	5.88E-04
n-Butane	0.01	3.63E-04	0.06	1.60E-03
Isopentane	0.01	1.22E-04	0.05	5.03E-04
n-Pentane	0.02	1.26E-04	0.07	5.10E-04
i-C6	0.07	2.09E-04	0.30	8.00E-04
n-Hexane	0.06	1.72E-04	0.27	6.35E-04
Benzene	5.87E-04	2.03E-06	2.57E-03	7.54E-06
Cyclohexane	3.95E-03	1.05E-05	0.02	3.86E-05
i-C7	0.01	1.09E-04	0.05	3.86E-04
n-Heptane	--	--	--	--
Toluene	1.66E-03	5.23E-06	0.01	1.79E-05
2,2,4-Trimethylpentane	1.15E-06	3.27E-09	5.04E-06	1.15E-08
n-Octane	0.10	2.84E-04	0.43	9.02E-04
Ethylbenzene	9.11E-04	2.60E-06	3.99E-03	8.24E-06
m-Xylene	1.43E-04	3.10E-07	6.25E-04	9.79E-07
3-Methyloctane	--	--	--	--
n-Nonane	0.01	2.93E-05	0.04	8.59E-05
H2S	0.02	4.09E-03	0.10	0.02
Water	1.44E-04	5.60E-04	6.30E-04	2.34E-03
C10+	4.02E-05	1.42E-07	1.76E-04	4.20E-07
<b>Total</b>	<b>0.34</b>	<b>0.03</b>	<b>1.50</b>	<b>0.21</b>
<b>Total CO2</b>	<b>0.01</b>	<b>0.01</b>	<b>0.05</b>	<b>0.07</b>
<b>Total Methane</b>	<b>2.37E-03</b>	<b>0.01</b>	<b>0.01</b>	<b>0.04</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.07</b>	<b>0.14</b>	<b>0.31</b>	<b>1.14</b>
<b>Total VOC</b>	<b>0.31</b>	<b>1.99E-03</b>	<b>1.34</b>	<b>0.01</b>
<b>Total HAP</b>	<b>0.07</b>	<b>1.82E-04</b>	<b>0.29</b>	<b>6.70E-04</b>

Marathon Oil EF, LLC  
Chatterton Tank Battery  
Heater Treater Burner Emissions

Background Information	
Emission Source	B-1
Heater/Boiler rating (MMBtu/hr):	1
Rating above is:	below 100 MMBtu/hr, uncontrolled
Operating hours/year:	8760
Estimated Propane Usage (gal/hr):	10.9290
Fuel Heat Value (Btu/scf) <sup>a</sup> :	56.92
Fuel Heat Value (Btu/gal) <sup>a</sup> :	91500
Fuel Rate (gal/yr):	95,738

<sup>a</sup> Heating value from AP-42 Table 1.5-1 for Propane (07/2008)

Pollutant	Emission Factor <sup>a</sup> (lb/10 <sup>3</sup> gal)	lb/hr	tpy
VOC	1.1	1.20E-05	5.27E-05
NOx	15	1.64E-04	7.18E-04
CO	8.4	9.18E-05	4.02E-04
PM <sub>10</sub>	0.8	8.74E-06	3.83E-05
PM <sub>2.5</sub>	0.8	8.74E-06	3.83E-05
SO <sub>2</sub>	0.09	9.84E-07	4.31E-06
<b>HAPS</b>			
Arsenic	0.0002	2.19E-09	9.57E-09
Benzene	0.0021	2.30E-08	1.01E-07
Beryllium	0.000012	1.31E-10	5.74E-10
Cadmium	0.0011	1.20E-08	5.27E-08
Chromium	0.0014	1.53E-08	6.70E-08
Cobalt	0.000084	9.18E-10	4.02E-09
Dichlorobenzene	0.0012	1.31E-08	5.74E-08
Formaldehyde	0.075	8.20E-07	3.59E-06
n-Hexane	1.8	1.97E-05	8.62E-05
Lead	0.0005	5.46E-09	2.39E-08
Manganese	0.00038	4.15E-09	1.82E-08
Mercury	0.00026	2.84E-09	1.24E-08
Naphthalene	0.00061	6.67E-09	2.92E-08
Nickel	0.0021	2.30E-08	1.01E-07
POM	0.000088	9.62E-10	4.21E-09
Toluene	0.0034	3.72E-08	1.63E-07
Selenium	0.000024	2.62E-10	1.15E-09
<b>Total HAPs</b>		<b>2.06E-05</b>	<b>9.04E-05</b>
<b>Other Pollutants</b>			
H <sub>2</sub> S	N/A <sup>c</sup>	--	--

<sup>a</sup> Emission factors are taken from AP-42, Chapter 1, Tables 1.5-1 dated July 2008.

<sup>b</sup> SO<sub>2</sub> emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>c</sup> H<sub>2</sub>S emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>d</sup> Greenhouse Gas Factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

<sup>e</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

Parameter	Value
scf/lbmole	379.3
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H <sub>2</sub> S molecular weight	34.08
SO <sub>2</sub> molecular weight	64.06

GHG Pollutant Emissions <sup>d,e</sup>		
GHG CO <sub>2</sub> Factor:	120,000	lb/MMscf
GHG CH <sub>4</sub> Factor:	2.3	lb/MMscf
GHG N <sub>2</sub> O Factor:	2.2	lb/MMscf
GWP CO <sub>2</sub> Equivalent:	1	
GWP CH <sub>4</sub> Equivalent:	25	
GWP N <sub>2</sub> O Equivalent:	298	
CO <sub>2</sub> emissions:	9,234.29	tpy
CH <sub>4</sub> emissions:	0.18	tpy
N <sub>2</sub> O emissions:	0.17	tpy
CO <sub>2</sub> e emissions:	9,289.17	tpy

H <sub>2</sub> S Max Concentration (ppmv)	H <sub>2</sub> S Mass to Heater Treater	H <sub>2</sub> S Mass to Heater Treater (tpy)
0	0.00E+00	0.00E+00

<sup>a</sup> H<sub>2</sub>S Mass to Heater Treater (lb/hr) = H<sub>2</sub>S Max Concentration (ppmv) / 10<sup>6</sup> \* Fuel Rate (scf/hr) / Standard Molar Volume (scf/lbmol) \* H<sub>2</sub>S MW (lb/lbmol)

Example Calculation (VOC):

EMISSION FACTOR	FEED RATE PER HOUR	HOURLY EMISSIONS	ANNUAL OPERATING HOURS	WEIGHT CONVERSION	ANNUAL EMISSIONS
1.1 lb VOC / MMscf Natural Gas Burned	10.9290 MMscf / hr	0.00 lb VOC / hr	8,760 hours / yr	1 ton / 2,000 lbs	0.00 tons VOC / yr

Criteria Pollutant Emission Factors obtained from AP-42 Nat Gas Combustion, Table 1.4-1, (7/98) < 100 MMBtu/hr heat input; & Table 1.4-2, (7/98) < 100 MMBtu/hr heat input.

Planned MSS - Degassing Due to Passive Expansion / Thermal Expansion / Non-Forced Ventilation

	Sales Tank 8092	Overflow Tank 8095	Reject Tank 8094	WTK-1
MSS Controls?	none	none	none	none
Control Efficiency (%)	0.0%	0.0%	0.0%	0.0%
Event duration, hours/event	1.00	1.00	1.00	1.00
Events per year	1.00	1.00	1.00	1.00
Tank Diameter, ft	12.00	12.00	12.00	15.50
Tank Height, ft	15.00	15.00	15.00	30.00
<sup>a</sup> Vapor Space Volume, ft <sup>3</sup>	848.2	848.2	848.2	2,830.4
<sup>b</sup> Venting Gas MW (lb/lb-mol)	34.75	37.27	37.27	26.86
<sup>b</sup> VOC wt %	0.06%	0.22%	0.22%	0.00%
<sup>b</sup> Benzene wt%	0.00%	0.00%	0.00%	0.00%
<sup>b</sup> H <sub>2</sub> S wt%	0.27%	0.44%	0.44%	0.11%
<sup>b</sup> HAPs wt%	0.01%	0.02%	0.02%	0.00%
<sup>b</sup> CO <sub>2</sub> wt%	0.50%	0.25%	0.25%	0.47%
<sup>b</sup> CH <sub>4</sub> wt%	0.10%	0.05%	0.05%	0.01%
Tank Temperature, °F	66.84	66.84	66.84	66.84
True Vapor Pressure, psia	5.23	5.23	5.23	5.23
Emissions, lb/event	27.24	29.22	29.22	70.26
Hourly Total Emissions, lb/hr	27.24	29.22	29.22	70.26
Annual Total Emissions, TPY	0.01	0.01	0.01	0.04
Total CO <sub>2</sub> , TPY	6.84E-05	3.61E-05	3.61E-05	1.63E-04
Total Methane, TPY	1.37E-05	7.90E-06	7.90E-06	2.05E-06
Total CO <sub>2</sub> e, TPY	4.12E-04	2.34E-04	2.34E-04	2.15E-04
Total VOC, TPY	8.80E-06	3.16E-05	3.16E-05	1.05E-08
Total HAP, TPY	9.08E-07	3.26E-06	3.26E-06	2.02E-10
Total H <sub>2</sub> S, TPY	3.74E-05	6.43E-05	6.43E-05	4.04E-05
Total Benzene, TPY	7.34E-09	2.63E-08	2.63E-08	1.32E-10

Total Emissions	lb/hr	TPY
Total	155.93	0.08
Total CO <sub>2</sub>	0.61	0.00
Total Methane	0.06	0.00
Total CO <sub>2</sub> e	2.19	0.00
Total VOC	0.14	0.00
Total HAP	0.01	0.00
Total H <sub>2</sub> S	0.41	0.00
Total Benzene	0.00	0.00

Ideal Gas Constant, [(ft<sup>3</sup>\*psia)/(R\*lb-mol)]  
10.73159

<sup>a</sup> Assuming 50% of tank is filled  
<sup>b</sup> From ProMax Tank Loss Stream

# APPENDIX B

## Emissions Calculations – Actual Emissions



Marathon Oil , LLC  
 Chatterton Tank Battery  
 Facility Information

<b>Oil and Gas Site General Information</b>	
<b>Administrative Information</b>	
Company Name	Marathon Oil , LLC
Facility/Well Name	Chatterton Tank Battery
Nearest City/Town	Riverton
County	Fremont

<b>Technical Information</b>	
Produced Gas Site Throughput (MMSCF/day):	0.04
Produced Gas Site Throughput (MMSCF/year):	15.11
Oil/Condensate Site Throughput (bbl/day):	92
Oil/Condensate Site Throughput (bbl/year):	33,522
Produced Water Site Throughput (bbl/day):	31,664
Produced Water Site Throughput (bbl/year):	11,557,360
Are there any sour gas streams at this site?	Yes
Gas H2S Concentration (ppm)	88,573
Has this site been registered before?	Yes

<b>Equipment/Process Types</b>	<b>How many for this project?</b>
Fugitives	NO
IC Engines	0
Turbines	0
Compressors (electric)	0
Diesel Engines	0
Heaters-Boilers	1
Separators	2
Oil / Condensate Tanks	1
Produced Water Tanks	1
Miscellaneous Tanks	3
Loading Jobs	0
Glycol Units	0
Amine Units	0
Vapor Recovery Units	0
Flares-Vapor Combustors	0
Thermal Oxidizers	0
MSS	YES



**Marathon Oil, LLC  
Chatterton Tank Battery  
Fugitive Emissions**

**Background Information**

Total fugitive component counts are based on equipment counts at the facility and default average component counts for major crude oil production equipment (40 CFR Part 98, Subpart W, Table W-1C) and major onshore natural gas production equipment (40 CFR Part 98, Subpart W, Table W-1B). Since both light oil and gas components are present at the facility, the emissions assume the maximum component emission factor.

**Component Count for Oil Production**

Major equipment	Valves	Flanges	Connectors	Open-ended lines	Other components
Wellhead	5	10	4	0	1
Separator	6	12	10	0	0
Meters/piping	0	0	0	0	0
Heater-treater	8	12	20	0	0
Header	5	10	4	0	0
In-line heaters	0	0	0	0	0
Dehydrators	0	0	0	0	0
Compressors	0	0	0	0	0

**Component Count for Gas Production (Western US)**

Major equipment	Valves	Flanges	Connectors	Open-ended lines	Other components
Wellhead	11	0	36	1	0
Separators	34	0	106	6	2
Meters/piping	14	0	51	1	1
Heater-treater	0	0	0	0	0
Header	0	0	0	0	0
In-line heaters	14	0	65	2	1
Dehydrators	24	0	90	2	2
Compressors	73	0	179	3	4

**Facility Equipment Counts**

Major equipment	Gas Production	Oil Production
Wellhead	0	0
Separator	2	2
Meters/piping	1	2
Heater-treater	N/A	1
Header	1	1
In-line heaters	0	N/A
Dehydrators	0	N/A
Compressors	0	N/A

Component Service	Component Counts - MRR Approach				
	Valve	Flanges	Connectors	Open-Ended Line	Other Components
Gas Service	82	0	263	13	5
Light Oil Service	25	46	44	0	0

**Emissions Estimate**

Liquid Equipment/Service	Oil and Gas Production Operations Emission Factor <sup>a</sup> (Light Oil)	Oil and Gas Production Operations Emission Factor <sup>a</sup> (Gas)	# Light Oil Components	# Gas Components	Short-Term TOC Emissions <sup>b</sup>	Annual TOC Emissions <sup>c</sup>
	(lb TOC/hr/component)	(lb TOC/hr/component)			(lb/hr)	(ton/yr)
Valves	0.0035	0.00992	25	82	0.95	4.17
Flanges	0.00243	0.00086	46	0	0.01	0.05
Open-Ended Lines	0.00309	0.00441	0	13	0.06	0.25
Connectors	0.000463	0.00044	44	263	0.14	0.60
Other	0.0165	0.0194	0	5	0.10	0.42
<b>Total</b>					<b>1.25</b>	<b>5.49</b>

<sup>a</sup> Emission factors are for oil and gas production facilities (not refineries) come from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4.

<sup>b</sup> Controlled Short-Term ER (lb/hr) = (100% - Reduction Factor) \* Σ(Number of Components \* Emissions Factor [lb/hr/component]).

<sup>c</sup> Controlled Annual ER (tpy) = Controlled Short-Term ER (lb/hr) \* 8,760 (hr/yr) / 2,000 (lb/ton).

<sup>d</sup> No reduction from LDAR monitoring is being claimed.

Marathon Oil, LLC  
Chatterton Tank Battery  
Fugitive Emissions

Speciated Fugitive Emissions\*

Component	Light Oil (lb/hr)	Light Oil (ton/year)	Gas (lb/hr)	Gas (ton/year)	Total (lb/hr)	Total (ton/year)
Nitrogen	0.05	0.23	2.10	9.20	2.15	9.43
CO <sub>2</sub>	0.93	4.06	2.67	11.71	3.60	15.76
Methane	0.19	0.81	1.42	6.20	1.60	7.01
Ethane	0.05	0.24	0.11	0.47	0.16	0.71
Propane	0.04	0.19	0.13	0.56	0.17	0.75
Isobutane	0.01	0.05	0.05	0.20	0.06	0.26
n-Butane	0.03	0.14	0.14	0.61	0.17	0.75
Isopentane	0.01	0.05	0.06	0.24	0.07	0.29
n-Pentane	0.01	0.05	0.06	0.27	0.07	0.32
i-C6	0.02	0.08	0.12	0.53	0.14	0.60
n-Hexane	0.01	0.06	0.11	0.48	0.12	0.55
Benzene	1.37E-04	6.02E-04	1.29E-03	0.01	1.42E-03	0.01
Cyclohexane	9.33E-04	4.08E-03	0.01	0.03	0.01	0.03
i-C7	2.60E-03	0.01	0.08	0.36	0.08	0.37
n-Heptane	--	--	--	--	--	--
Toluene	3.73E-04	1.63E-03	4.25E-03	0.02	4.63E-03	0.02
2,2,4-Trimethylpentane	2.66E-07	1.16E-06	2.49E-06	1.09E-05	2.75E-06	1.21E-05
n-Octane	0.02	0.09	0.29	1.26	0.31	1.35
Ethylbenzene	1.95E-04	8.56E-04	2.67E-03	0.01	2.87E-03	0.01
m-Xylene	3.08E-05	1.35E-04	3.22E-04	1.41E-03	3.53E-04	1.55E-03
β-Methyloctane	--	--	--	--	--	--
n-Nonane	2.00E-03	0.01	0.04	0.17	0.04	0.17
H <sub>2</sub> S	0.50	2.20	1.12	4.92	1.63	7.12
Water	3.27E-05	1.43E-04	0.14	0.63	0.14	0.63
ClO <sub>2</sub>	8.25E-06	3.61E-05	2.51E-04	0.04	2.59E-04	0.04
<b>Total</b>	<b>1.89</b>	<b>8.29</b>	<b>8.65</b>	<b>37.90</b>	<b>10.54</b>	<b>46.19</b>
<b>TOC</b>	<b>0.41</b>	<b>1.79</b>	<b>2.61</b>	<b>11.45</b>	<b>3.02</b>	<b>13.24</b>
<b>VOC</b>	<b>0.17</b>	<b>0.74</b>	<b>1.08</b>	<b>4.78</b>	<b>1.25</b>	<b>5.52</b>
<b>Total HAP</b>	<b>0.02</b>	<b>0.07</b>	<b>0.12</b>	<b>0.52</b>	<b>0.13</b>	<b>0.59</b>

\*Fugitive oil emissions speciation is based on the crude oil tank W&B vapors. Fugitive gas emissions speciation is based on sales gas stream

Marathon Oil, LLC  
 Chatterton Tank Battery  
 Heater Treater Produced Gas

Identification		
Emission Source		HT-1
Produced Gas Throughput (MMscfd)		0.0324
Produced Gas Throughput (MMscf/yr)		11.84
Heater Treater Operating Parameters <sup>a</sup>		
Temperature (F)		155.0
Pressure (psig)		10.0

Notes

<sup>a</sup> From ProMax AP-42 Emissions Report

**Speciated Produced Gas Emissions -HT-1**

Component	Heater Treater Produced Gas	
	Produced Gas (lb/hr)	Produced Gas (tpy)
Nitrogen	49.94	218.75
CO2	20.27	88.78
Methane	17.11	74.96
Ethane	0.60	2.64
Propane	0.51	2.22
Isobutane	0.15	0.64
n-Butane	0.41	1.78
Isopentane	0.14	0.60
n-Pentane	0.14	0.62
i-C6	0.24	1.03
n-Hexane	0.20	0.86
Benzene	2.30E-03	0.01
Cyclohexane	0.01	0.05
i-C7	0.13	0.55
n-Heptane	--	--
Toluene	0.01	0.03
2,2,4-Trimethylpentane	3.81E-06	1.67E-05
n-Octane	0.34	1.48
Ethylbenzene	3.09E-03	0.01
m-Xylene	3.69E-04	1.62E-03
3-Methyloctane	--	--
n-Nonane	0.04	0.16
H2S	5.10	22.35
Water	0.84	3.67
C10+	1.82E-04	7.97E-04
<b>Total</b>	<b>96.16</b>	<b>421.19</b>
<b>Total CO2</b>	<b>20.27</b>	<b>88.78</b>
<b>Total Methane</b>	<b>17.11</b>	<b>74.96</b>
<b>Total CO<sub>2</sub>e</b>	<b>448.11</b>	<b>1,962.73</b>
<b>Total VOC</b>	<b>2.29</b>	<b>10.04</b>
<b>Total HAP</b>	<b>0.21</b>	<b>0.91</b>

Marathon Oil, LLC  
 Chatterton Tank Battery  
 Crude Oil Sales Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source	Sales Tank 8092	
Throughput (BPD)	91.84	
Throughput (BPY)	33,522	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	123.26	
Net Throughput (gal/yr)	1,407,907	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	8.14	
Total Uncontrolled Tank VOC Emissions		
VOC Flashing Losses (ton/yr) <sup>c</sup>	0.01	
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	0.20	
Total VOC Losses (ton/yr) <sup>c</sup>	0.21	

Notes  
<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Crude Oil Sales Tank Emissions

Component	Crude Oil Sales Tank- 300 BBL			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	0.01	0.05	0.06	0.07
CO2	0.25	0.13	1.09	0.07
Methane	0.05	0.06	0.22	0.04
Ethane	0.01	0.01	0.06	2.38E-03
Propane	0.01	0.01	0.05	2.10E-03
Isobutane	3.21E-03	2.57E-03	0.01	5.88E-04
n-Butane	0.01	0.01	0.04	1.60E-03
Isopentane	2.92E-03	2.82E-03	0.01	5.03E-04
n-Pentane	2.96E-03	3.05E-03	0.01	5.10E-04
i-C6	4.74E-03	0.01	0.02	8.00E-04
n-Hexane	3.98E-03	4.86E-03	0.02	6.35E-04
Benzene	3.69E-05	5.71E-05	1.62E-04	7.54E-06
Cyclohexane	2.50E-04	3.01E-04	1.10E-03	3.86E-05
i-C7	6.97E-04	3.38E-03	3.05E-03	3.88E-04
n-Heptane	--	--	--	--
Toluene	1.00E-04	1.70E-04	4.39E-04	1.79E-05
2,2,4-Trimethylpentane	7.14E-08	1.02E-07	3.13E-07	1.15E-08
n-Octane	0.01	0.01	0.02	9.02E-04
Ethylbenzene	5.25E-05	9.72E-05	2.30E-04	8.24E-06
m-Xylene	8.28E-06	1.17E-05	3.63E-05	9.79E-07
3-Methyloctane	--	--	--	--
n-Nonane	5.37E-04	1.25E-03	2.35E-03	8.59E-05
H2S	0.14	0.07	0.59	0.02
Water	8.78E-06	0.01	3.85E-05	2.34E-03
C10+	2.22E-06	6.57E-06	9.71E-06	4.20E-07
<b>Total</b>	<b>0.51</b>	<b>0.37</b>	<b>2.22</b>	<b>0.21</b>
<b>Total CO2</b>	<b>0.25</b>	<b>0.13</b>	<b>1.09</b>	<b>0.07</b>
<b>Total Methane</b>	<b>0.05</b>	<b>0.06</b>	<b>0.22</b>	<b>0.04</b>
<b>Total CO<sub>2</sub>e</b>	<b>1.49</b>	<b>1.53</b>	<b>6.54</b>	<b>1.14</b>
<b>Total VOC</b>	<b>0.05</b>	<b>0.05</b>	<b>0.20</b>	<b>0.01</b>
<b>Total HAP</b>	<b>4.18E-03</b>	<b>0.01</b>	<b>0.02</b>	<b>6.70E-04</b>

Marathon Oil, LLC  
 Chatterton Tank Battery  
 Crude Oil Overflow Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source	Overflow Tank 8095	
Throughput (BPD)	5.00	
Throughput (BPY)	1.825	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	6.71	
Net Throughput (gal/yr)	76,650	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	8.14	
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>d</sup>	0.09	

- Notes:
- <sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.
  - <sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.
  - <sup>c</sup> From ProMax AP-42 Emissions Report

Component	Crude Oil Overflow Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	1.84E-03	0.01
CO2	0.02	0.09
Methane	4.73E-03	0.02
Ethane	1.93E-03	0.01
Propane	4.97E-03	0.02
Isobutane	1.39E-03	0.01
n-Butane	3.82E-03	0.02
Isopentane	1.27E-03	0.01
n-Pentane	1.28E-03	0.01
i-C6	2.06E-03	0.01
n-Hexane	1.73E-03	0.01
Benzene	1.60E-05	7.01E-05
Cyclohexane	1.09E-04	4.76E-04
i-C7	3.03E-04	1.33E-03
n-Heptane	--	--
Toluene	4.35E-05	1.91E-04
2,2,4-Trimethylpentane	3.10E-08	1.36E-07
n-Octane	2.46E-03	0.01
Ethylbenzene	2.28E-05	9.97E-05
m-Xylene	3.59E-06	1.57E-05
3-Methyloctane	--	--
n-Nonane	2.33E-04	1.02E-03
H2S	0.04	0.17
Water	3.81E-06	1.67E-05
C10+	9.62E-07	4.21E-06
<b>Total</b>	<b>0.09</b>	<b>0.39</b>
<b>Total CO2</b>	<b>0.02</b>	<b>0.09</b>
<b>Total Methane</b>	<b>4.73E-03</b>	<b>0.02</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.14</b>	<b>0.61</b>
<b>Total VOC</b>	<b>0.02</b>	<b>0.09</b>
<b>Total HAP</b>	<b>1.81E-03</b>	<b>0.01</b>

Marathon Oil, LLC  
 Chatterton Tank Battery  
 Crude Reject Oil Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source		Reject Tank 6094
Throughput (BPD)		5.00
Throughput (BPY)		1,825
Tank Dimensions		
Shell Height (ft)		15.0
Diameter (ft)		12.0
Volume (gal)		12,690
Turnovers <sup>a</sup>		6.71
Net Throughput (gal/yr)		76,650
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>		Tan
Shell & Roof Condition		Good
Meteorological Data		Cheyenne, WY
Tank Contents		
Crude RVP <sup>c</sup>		8.14
Water		
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>		0.09

Notes  
<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report.

Component	Crude Oil Reject Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	1.84E-03	0.01
CO2	0.02	0.09
Methane	4.73E-03	0.02
Ethane	1.93E-03	0.01
Propane	4.97E-03	0.02
Isobutane	1.39E-03	0.01
n-Butane	3.82E-03	0.02
Isopentane	1.27E-03	0.01
n-Pentane	1.28E-03	0.01
i-C6	2.06E-03	0.01
n-Hexane	1.73E-03	0.01
Benzene	1.60E-05	7.01E-05
Cyclohexane	1.09E-04	4.76E-04
i-C7	3.03E-04	1.33E-03
n-Heptane	--	--
Toluene	4.35E-05	1.91E-04
2,2,4-Trimethylpentane	3.10E-08	1.36E-07
n-Octane	2.46E-03	0.01
Ethylbenzene	2.28E-05	9.97E-05
m-Xylene	3.59E-06	1.57E-05
3-Methyloctane	--	--
n-Nonane	2.33E-04	1.02E-03
H2S	0.04	0.17
Water	3.81E-06	1.67E-05
C10+	9.62E-07	4.21E-06
<b>Total</b>	<b>0.09</b>	<b>0.39</b>
<b>Total CO2</b>	<b>0.02</b>	<b>0.09</b>
<b>Total Methane</b>	<b>4.73E-03</b>	<b>0.02</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.14</b>	<b>0.61</b>
<b>Total VOC</b>	<b>0.02</b>	<b>0.09</b>
<b>Total HAP</b>	<b>1.81E-03</b>	<b>0.01</b>

Marathon Oil, LLC  
 Chatterton Tank Battery  
 Produced Water Tanks

Identification - Vertical Fixed Roof Tanks		
Emission Source	WTK-1 & WTK-2	
Throughput (BPD)	31,664.00	
Throughput (BPY)	11,557,360	
Tank Dimensions		
Shell Height (ft)	30.0	
Diameter (ft)	15.5	
Volume (gal)	41,500	
Turnovers <sup>a</sup>	12,735.44	
Net Throughput (gal/yr)	485,409,120	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	8.14	
Water (Mol %)	99.97%	
Total Uncontrolled Tank VOC Emissions (each)		
VOC Flashing Losses (ton/yr) <sup>c</sup>	0.81	
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	2.76E-04	
Total VOC Losses (ton/yr) <sup>c</sup>	0.81	

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report.

Speciated Produced Water Tank Emissions -WTK-1 & WTK-2

Component	Produced Water Skim Tanks- 1,000 BBL (each)			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	0.01	10.04	0.04	37.62
CO2	1.52	27.75	6.65	50.53
Methane	0.02	6.23	0.08	20.85
Ethane	1.02E-03	0.29	4.45E-03	0.84
Propane	1.00E-04	0.18	4.39E-04	0.58
Isobutane	5.47E-06	0.04	2.40E-05	0.12
n-Butane	1.63E-05	0.14	7.12E-05	0.44
Isopentane	1.04E-06	0.03	4.55E-06	0.11
n-Pentane	9.22E-08	0.02	4.04E-07	0.06
i-C6	1.37E-07	0.03	5.99E-07	0.13
n-Hexane	1.41E-08	0.02	6.19E-08	0.06
Benzene	1.71E-06	3.34E-03	7.48E-06	4.50E-03
Cyclohexane	1.73E-07	0.01	7.59E-07	0.02
i-C7	2.78E-09	0.01	1.22E-08	0.05
n-Heptane	--	--	--	--
Toluene	9.36E-07	0.01	4.10E-06	0.01
2,2,4-Trimethylpentane	2.03E-13	3.07E-07	8.88E-13	1.12E-06
n-Octane	8.44E-11	0.01	3.70E-10	0.03
Ethylbenzene	1.34E-07	4.26E-03	5.89E-07	0.01
m-Xylene	1.25E-08	5.01E-04	5.48E-08	7.07E-04
3-Methyloctane	--	--	--	--
n-Nonane	3.61E-12	8.13E-04	1.58E-11	3.42E-03
H2S	0.38	7.70	1.65	12.99
Water	--	--	--	1.34
C10+	4.12E-12	4.02E-05	1.81E-11	1.11E-04
<b>Total</b>	<b>1.93</b>	<b>52.51</b>	<b>8.43</b>	<b>125.81</b>
<b>Total CO2</b>	<b>1.52</b>	<b>27.75</b>	<b>6.65</b>	<b>50.53</b>
<b>Total Methane</b>	<b>0.02</b>	<b>6.23</b>	<b>0.08</b>	<b>20.85</b>
<b>Total CO<sub>2</sub>e</b>	<b>2.00</b>	<b>183.49</b>	<b>8.74</b>	<b>571.87</b>
<b>Total VOC</b>	<b>1.26E-04</b>	<b>0.50</b>	<b>5.53E-04</b>	<b>1.63</b>
<b>Total HAP</b>	<b>2.81E-06</b>	<b>0.03</b>	<b>1.23E-05</b>	<b>0.08</b>

Marathon Oil, LLC  
 Chatterton Tank Battery  
 Pop & Rupture Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source		P&R Tank
Throughput (BPY)		1,072
Tank Dimensions		
Shell Height (ft)		24.0
Diameter (ft)		25.0
Volume (gal)		88,128
Turnovers <sup>a</sup>		0.57
Net Throughput (gal/yr)		45,024
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>		Tan
Shell & Roof Condition		Fair
Metereological Data		Cheyenne, WY
Tank Contents		
Crude RVP <sup>c</sup>		8.14
Total Uncontrolled Tank VOC Emissions		
VOC Flashing Losses (ton/yr) <sup>c</sup>		0.01
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>		1.34
Total VOC Losses (ton/yr) <sup>c</sup>		1.35

Notes  
<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank-shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Pop & Rupture Tank Emissions

Component	Pop & Rupture Tank- 2000 BBL			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	1.13E-03	0.01	4.93E-03	0.07
CO2	0.01	0.01	0.05	0.07
Methane	2.37E-03	0.01	0.01	0.04
Ethane	1.07E-03	4.15E-04	4.67E-03	2.38E-03
Propane	4.04E-03	4.29E-04	0.02	2.10E-03
Isobutane	3.23E-03	1.30E-04	0.01	5.88E-04
n-Butane	0.01	3.63E-04	0.06	1.60E-03
Isopentane	0.01	1.22E-04	0.05	5.03E-04
n-Pentane	0.02	1.26E-04	0.07	5.10E-04
i-C6	0.07	2.09E-04	0.30	6.00E-04
n-Hexane	0.06	1.72E-04	0.27	6.35E-04
Benzene	5.87E-04	2.03E-06	2.57E-03	7.54E-06
Cyclohexane	3.95E-03	1.05E-05	0.02	3.86E-05
i-C7	0.01	1.09E-04	0.05	3.88E-04
n-Heptane	--	--	--	--
Toluene	1.66E-03	5.23E-06	0.01	1.79E-05
2,2,4-Trimethylpentane	1.15E-06	3.27E-09	5.04E-06	1.15E-08
n-Octane	0.10	2.84E-04	0.43	9.02E-04
Ethylbenzene	9.11E-04	2.60E-06	3.99E-03	8.24E-06
m-Xylene	1.43E-04	3.10E-07	6.25E-04	9.79E-07
3-Methyloctane	--	--	--	--
n-Nonane	0.01	2.93E-05	0.04	8.59E-05
H2S	0.02	4.09E-03	0.10	0.02
Water	1.44E-04	5.60E-04	6.30E-04	2.34E-03
C10+	4.02E-05	1.42E-07	1.76E-04	4.20E-07
<b>Total</b>	<b>0.34</b>	<b>0.03</b>	<b>1.50</b>	<b>0.21</b>
Total CO2	0.01	0.01	0.05	0.07
Total Methane	2.37E-03	0.01	0.01	0.04
Total CO <sub>2</sub> e	0.07	0.14	0.31	1.14
Total VOC	0.31	1.99E-03	1.34	0.01
Total HAP	0.07	1.82E-04	0.29	6.70E-04

Marathon Oil EF, LLC  
Chatterton Tank Battery  
Heater Treater Burner Emissions

Background Information	
Emission Source	B-1 <sup>a</sup>
Heater/Boiler rating (MMBtu/hr):	1
Rating above is:	below 100 MMBtu/hr, uncontrolled
Operating hours/year:	8760
Estimated Propane Usage (gal/hr):	10.9290
Fuel Heat Value (Btu/scf) <sup>b</sup> :	52.82
Fuel Heat Value (Btu/gal) <sup>b</sup> :	91500
Fuel Rate (gal/yr):	95.738

<sup>a</sup> Heating value from AP-42 Table 1.5-1 for Propane (07/2008)

Pollutant	Emission Factor <sup>a</sup> (lb/10 <sup>3</sup> gal)	lb/hr	tpy
VOC	1.1	1.20E-05	5.27E-05
NOx	15	1.64E-04	7.18E-04
CO	8.4	9.18E-05	4.02E-04
PM <sub>10</sub>	0.8	8.74E-06	3.83E-05
PM <sub>2.5</sub>	0.8	8.74E-06	3.83E-05
SO <sub>2</sub>	0.09	9.84E-07	4.31E-06
<b>HAPS</b>			
Arsenic	0.0002	2.19E-09	9.57E-09
Benzene	0.0021	2.30E-08	1.01E-07
Beryllium	0.000012	1.31E-10	5.74E-10
Cadmium	0.0011	1.20E-08	5.27E-08
Chromium	0.0014	1.53E-08	6.70E-08
Cobalt	0.000084	9.18E-10	4.02E-09
Dichlorobenzene	0.0012	1.31E-08	5.74E-08
Formaldehyde	0.075	8.20E-07	3.59E-06
n-Hexane	1.8	1.97E-05	8.62E-05
Lead	0.0005	5.46E-09	2.39E-08
Manganese	0.00038	4.15E-09	1.82E-08
Mercury	0.00026	2.84E-09	1.24E-08
Naphthalene	0.00061	6.67E-09	2.92E-08
Nickel	0.0021	2.30E-08	1.01E-07
POM	0.000088	9.62E-10	4.21E-09
Toluene	0.0034	3.72E-08	1.63E-07
Selenium	0.000024	2.62E-10	1.15E-09
<b>Total HAPs</b>		<b>2.06E-05</b>	<b>9.04E-05</b>
<b>Other Pollutants</b>			
H <sub>2</sub> S	N/A <sup>c</sup>	--	--

<sup>a</sup> Emission factors are taken from AP-42, Chapter 1, Tables 1.5-1 dated July 2008.

<sup>b</sup> SO<sub>2</sub> emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>c</sup> H<sub>2</sub>S emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>d</sup> Greenhouse Gas Factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

<sup>e</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

Parameter	Value
scf/lbmole	379.3
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H <sub>2</sub> S molecular weight	34.08
SO <sub>2</sub> molecular weight	64.06

GHG Pollutant Emissions <sup>d,e</sup>	
GHG CO <sub>2</sub> Factor:	120,000 lb/MMscf
GHG CH <sub>4</sub> Factor:	2.3 lb/MMscf
GHG N <sub>2</sub> O Factor:	2.2 lb/MMscf
GWP CO <sub>2</sub> Equivalent:	1
GWP CH <sub>4</sub> Equivalent:	25
GWP N <sub>2</sub> O Equivalent:	298
CO <sub>2</sub> emissions:	9,951.70 tpy
CH <sub>4</sub> emissions:	0.19 tpy
N <sub>2</sub> O emissions:	0.18 tpy
CO <sub>2</sub> e emissions:	10,010.83 tpy

H <sub>2</sub> S Max Concentration (ppmv)	H <sub>2</sub> S Mass to Heater Treater	H <sub>2</sub> S Mass to Heater Treater (tpy)
0	0.00E+00	0.00E+00

<sup>a</sup> H<sub>2</sub>S Mass to Heater Treater (lb/hr) = H<sub>2</sub>S Max Concentration (ppmv) / 10<sup>6</sup> \* Fuel Rate (scf/hr) / Standard Molar Volume (scf/lbmol) \* H<sub>2</sub>S MW (lb/lbmol)

Example Calculation (VOC):

EMISSION FACTOR	FEED RATE PER HOUR	HOURLY EMISSIONS	ANNUAL OPERATING HOURS	WEIGHT CONVERSION	ANNUAL EMISSIONS
1.1 lb VOC MMscf Natural Gas Burned	x 10.9290 MMscf hr	= 0.00 lb VOC hr	x 8,760 hours yr	x 1 ton 2,000 lbs	= 0.00 tons VOC yr

Criteria Pollutant Emission Factors obtained from AP-42 Nat Gas Combustion, Table 1.4-1, (7/98) < 100 MMBtu/hr heat input; & Table

Planned MSS - Degassing Due to Passive Expansion / Thermal Expansion / Non-Forced Ventilation

	Sales Tank 8092	Overflow Tank 8095	Reject Tank 8094	WTK-1
MSS Controls?	none	none	none	none
Control Efficiency (%)	0.0%	0.0%	0.0%	0.0%
Event duration, hours/event	1.00	1.00	1.00	1.00
Events per year	1.00	1.00	1.00	1.00
Tank Diameter, ft	12.00	12.00	12.00	15.50
Tank Height, ft	15.00	15.00	15.00	30.00
<sup>a</sup> Vapor Space Volume, ft <sup>3</sup>	848.2	848.2	848.2	2,830.4
<sup>b</sup> Venting Gas MW (lb/lb-mol)	35.20	37.50	37.50	26.84
<sup>b</sup> VOC wt %	0.09%	0.22%	0.22%	0.00%
<sup>b</sup> Benzene wt%	0.00%	0.00%	0.00%	0.00%
<sup>b</sup> H <sub>2</sub> S wt%	0.27%	0.43%	0.43%	0.12%
<sup>b</sup> HAPs wt%	0.01%	0.02%	0.02%	0.00%
<sup>b</sup> CO <sub>2</sub> wt%	0.49%	0.25%	0.25%	0.46%
<sup>b</sup> CH <sub>4</sub> wt%	0.10%	0.05%	0.05%	0.01%
Tank Temperature, °F	66.84	66.84	66.84	66.84
True Vapor Pressure, psia	5.23	5.23	5.23	5.23
Emissions, lb/event	27.59	29.40	29.40	70.21
Hourly Total Emissions, lb/hr	27.59	29.40	29.40	70.21
Annual Total Emissions, TPY	0.01	0.01	0.01	0.04
Total CO <sub>2</sub> , TPY	6.75E-05	3.61E-05	3.61E-05	1.63E-04
Total Methane, TPY	1.35E-05	7.87E-06	7.87E-06	2.05E-06
Total CO <sub>2</sub> e, TPY	4.05E-04	2.33E-04	2.33E-04	2.14E-04
Total VOC, TPY	1.23E-05	3.28E-05	3.28E-05	1.35E-08
Total HAP, TPY	1.14E-06	3.02E-06	3.02E-06	3.01E-10
Total H <sub>2</sub> S, TPY	3.67E-05	6.39E-05	6.39E-05	4.04E-05
Total Benzene, TPY	1.00E-08	2.67E-08	2.67E-08	1.83E-10

Total Emissions	lb/hr	TPY
Total	156.60	0.08
Total CO <sub>2</sub>	0.61	0.00
Total Methane	0.06	0.00
Total CO <sub>2</sub> e	2.17	0.00
Total VOC	0.16	0.00
Total HAP	0.01	0.00
Total H <sub>2</sub> S	0.41	0.00
Total Benzene	0.00	0.00

Ideal Gas Constant, [(ft<sup>3</sup>\*psia)/(R\*lb-mol)]  
10.73159

<sup>a</sup> Assuming 50% of tank is filled  
<sup>b</sup> From ProMax Tank Loss Stream

# APPENDIX C

Tribal NSR Synthetic Minor Forms



 <p style="margin: 0;"><b>UNITED STATES ENVIRONMENTAL PROTECTION AGENCY</b>  <b>FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY</b>  <b>40 CFR 49.151</b></p> <p style="margin: 0;"><b>Registration for Existing Sources</b>  <b>(FORM REG)</b></p>
<p><b>Use of this information request form is voluntary and not yet approved by the Office of Management and Budget.</b> The following is a check list of the type of information that Region 8 will use to process information on your registration. While submittal of this form is not required, it does offer details on the information we will use to complete your registration and providing the information requested will help build an existing source emissions inventory. Use of application forms for this program is currently under Office of Management and Budget review and these information request forms will be replaced/updated after that review is completed.</p>

**Please submit information to following two entities:**

Federal Minor NSR Permit Coordinator  
 U.S. EPA, Region 8  
 1595 Wynkoop Street, 8P-AR  
 Denver, CO 80202-1129  
[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

For more information, visit:  
<http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8>

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact:

[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

**A. GENERAL SOURCE INFORMATION**

1. (a) <b>Company Name</b> (Who owns this facility?) <b>Marathon Oil Company</b>		2. <b>Facility Name</b> <b>Chatterton Tank Battery</b>	
(b) <b>Operator Name</b> (Is the company that operates this facility different than the company that owns this facility? What is the name of the company?) <b>Marathon Oil Company</b>			
3. Type of Operation <b>Oil Production</b>		4. Portable Source?    Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> 5. Temporary Source?    Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
6. NAICS Code <b>211111-</b>		7. SIC Code <b>1311</b>	
8. Physical Address (Or, home base for portable sources) <b>N/A</b>			
9. Reservation* <b>Wind River</b>	10. County* <b>Fremont</b>	11a. Latitude (decimal format)* <b>43.50164784</b>	11b. Longitude (decimal format)* <b>-108.9874665</b>
12a. Quarter Quarter Section* <b>NESW</b>	12b. Section* <b>15</b>	12c. Township* <b>6N</b>	12d. Range* <b>2W</b>

\* Provide all locations of operation for portable sources

**B. CONTACT INFORMATION**

<b>Company Contact</b> (Who is the <u>primary</u> contact for the company that owns this facility?) Jon F. Salomonsen		Title <b>Operations Manager</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>jfsalomonsen@marathonoil.com</b>		
Telephone Number <b>(713) 408-8096</b>	Facsimile Number <b>(307) 857-1299</b>	
<b>Operator Contact</b> (Is the company that operates this facility different than the company that owns this facility? Who is the <u>primary</u> contact for the company that operates this source?) Justin LaJeunesse		Title <b>Production Superintendent</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>jlajeunesse@marathonoil.com</b>		
Telephone Number <b>(307) 527-6228 x 2222</b>	Facsimile Number <b>(307) 857-1299</b>	
<b>Permitting Contact</b> (Who is the person <u>primarily</u> responsible for Clean Air Act permitting for the company? We are seeking one main contact for the company. Please do not list consultants.) Donna M. Stevison		Title <b>Advanced HES Professional</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>dmstevison@marathonoil.com</b>		
Telephone Number <b>(307) 254-2760</b>	Facsimile Number <b>(307) 857-1299</b>	
<b>Compliance Contact</b> (Is the person responsible for Clean Air Act compliance for this company different than the person responsible for Clean Air Act permitting? Who is the person <u>primarily</u> responsible for Clean Air Act compliance for the company? We are seeking one main contact for the company. Please do not list consultants.) Donna M. Stevison		Title <b>Advanced HES Professional</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>dmstevison@marathonoil.com</b>		
Telephone Number <b>(307) 254-2760</b>	Facsimile Number <b>(307) 857-1299</b>	

**C. ATTACHMENTS****Include all of the following information as attachments to this form**

- Narrative description of the operations
- Identification and description of all emission units and air pollution generating activities (with the exception of the exempt emissions units and activities listed in §49.153(c))
- Identification and description of any existing air pollution control equipment and compliance monitoring devices or activities
- Type and amount of each fuel used
- Type raw materials used
- Production Rates
- Operating Schedules
- Any existing limitations on source operations affecting emissions or any work practice standards, where applicable, for all regulated NSR pollutants at your source.
- Total allowable (potential to emit if there are no legally and practically enforceable restrictions) emissions from the air pollution source for the following air pollutants: particulate matter, PM<sub>10</sub>, PM<sub>2.5</sub>, sulfur oxides (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub>), hydrogen sulfide (H<sub>2</sub>S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.
- Estimates of the total actual emissions from the air pollution source for the following air pollutants: particulate matter, PM<sub>10</sub>, PM<sub>2.5</sub>, sulfur oxides (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub>), hydrogen sulfide (H<sub>2</sub>S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.
- Other

The public reporting and recordkeeping burden for this collection of information is estimated to average 6 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**D. TABLE OF ESTIMATED EMISSIONS**

The following estimates of the total emissions in tons/year for all pollutants contained in your worksheet stated above should be provided.

Pollutant	Total Actual Emissions (tpy)	Total Allowable or Potential Emissions (TPY)	
PM	3.83E-05	3.83E-05	PM - Particulate Matter PM <sub>10</sub> - Particulate Matter less than 10 microns in size PM <sub>2.5</sub> - Particulate Matter less than 2.5 microns in size SO <sub>2</sub> - Sulfur Oxides NO <sub>x</sub> - Nitrogen Oxides CO - Carbon Monoxide VOC - Volatile Organic Compound Pb - Lead and lead compounds Fluorides - Gaseous and particulates H <sub>2</sub> SO <sub>4</sub> - Sulfuric Acid Mist H <sub>2</sub> S - Hydrogen Sulfide TRS - Total Reduced Sulfur RSC - Reduced Sulfur Compounds
PM <sub>10</sub>	3.83E-05	3.83E-05	
PM <sub>2.5</sub>	3.83E-05	3.83E-05	
SO <sub>2</sub>	4.31E-06	4.31E-06	
NO <sub>x</sub>	7.18E-04	7.18E-04	
CO	4.02E-04	4.02E-04	
VOC	18.92	19.51	
Pb	--	--	
Fluorides	--	--	
H <sub>2</sub> SO <sub>4</sub>	--	--	
H <sub>2</sub> S	45.18	63.19	
TRS	--	--	
RSC	--	--	

Emissions calculations must include fugitive emissions if the source is one the following listed sources, pursuant to CAA Section 302(j):

- (a) Coal cleaning plants (with thermal dryers);
- (b) Kraft pulp mills;
- (c) Portland cement plants;
- (d) Primary zinc smelters;
- (e) Iron and steel mills;
- (f) Primary aluminum ore reduction plants;
- (g) Primary copper smelters;
- (h) Municipal incinerators capable of charging more than 250 tons of refuse per day;
- (i) Hydrofluoric, sulfuric, or nitric acid plants;
- (j) Petroleum refineries;
- (k) Lime plants;
- (l) Phosphate rock processing plants;
- (m) Coke oven batteries;
- (n) Sulfur recovery plants;
- (o) Carbon black plants (furnace process);
- (p) Primary lead smelters;
- (q) Fuel conversion plants;
- (r) Sintering plants;
- (s) Secondary metal production plants;
- (t) Chemical process plants
- (u) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input;
- (v) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
- (w) Taconite ore processing plants;
- (x) Glass fiber processing plants;
- (y) Charcoal production plants;
- (z) Fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input, and
- (aa) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

# APPENDIX D

Laboratory Analysis





# AIR POLLUTION TESTING, INC.

DENVER, SALT LAKE CITY

5530 Marshall Street  
 Arvada, Colorado 80002  
 Phone: 303-420-5949  
 Fax: 303-420-5920

## EXTENDED GAS ANALYSIS

### SAMPLE DATA

PROJECT NO..... LARC6066  
 COMPANY NAME..... Arcadis, Inc.  
 SITE..... Chatterton  
 UNIT ID..... Heater Treater  
 SAMPLED BY..... DW

SAMPLE ID..... Liberated Gas  
 ANALYSIS DATE..... 6/17/2016  
 SAMPLE DATE..... 6/15/2016  
 CYLINDER NO..... 38671  
 LAB ANALYST..... CB

### FIELD DATA

SAMPLE PRESSURE..... 8 psig  
 AMBIENT PRESSURE..... 11.4 psi

SAMPLE TEMP..... 125 F  
 AMBIENT TEMP..... 57 F

COMMENTS: Gas to Oil Ratio = 0.9 scf/bbl

### LABORATORY DATA

COMPONENT	MOLE %	WT%	GPM
HYDROGEN SULFIDE.....	4.3529	4.5854	0.5899
CARBON DIOXIDE.....	21.7568	29.5959	3.7224
NITROGEN.....	26.2085	22.6934	2.8907
METHANE.....	40.3719	20.0190	6.8616
ETHANE.....	0.1925	0.1789	0.0516
PROPANE.....	0.0914	0.1246	0.0252
ISOBUTANE.....	0.1789	0.3214	0.0587
N-BUTANE.....	0.1006	0.1807	0.0318
ISOPENTANE.....	0.1963	0.4378	0.0720
N-PENTANE.....	0.0864	0.1926	0.0314
CYCLOPENTANE.....	0.0631	0.1369	0.0187
N-HEXANE.....	0.2843	0.7573	0.1172
CYCLOHEXANE.....	0.0888	0.2309	0.0303
OTHER HEXANES.....	0.4761	1.2681	0.1963
HEPTANES.....	0.6488	2.0096	0.3002
METHYLCYCLOHEXANE.....	0.0403	0.1223	0.0162
2,2,4 TRIMETHYLPENTANE.....	0.0147	0.0520	0.0074
BENZENE.....	0.0000	0.0000	0.0000
TOLUENE.....	0.0251	0.0716	0.0084
ETHYLBENZENE.....	0.0059	0.0193	0.0023
XYLENES.....	0.0195	0.0639	0.0076
C8+ HEAVIES.....	4.7973	16.9385	2.4625
SUBTOTAL	100.0000	100.0000	17.5025
OXYGEN/ARGON	0.0000	0.0000	0.0000
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>17.5025</b>

### BTU @

MOLECULAR WEIGHT.....	32.3526	NET DRY REAL	772.8483 /scf
RELATIVE DENSITY (AIR=1).....	1.1171	GROSS DRY REAL	849.3993 /scf
COMPRESSIBILITY FACTOR.....	0.9949	GROSS WET REAL	834.9393 /scf

EXTENDED LIQUID ANALYSIS

**SAMPLE DATA**

PROJECT NO..... LARC6066  
COMPANY NAME..... Arcadis, Inc.  
SITE..... Chatterton  
UNIT ID..... Heater Treater  
SAMPLED BY..... DW

SAMPLE ID..... Pressurized Liquid  
ANALYSIS DATE..... 6/16/2016  
SAMPLE DATE..... 6/15/2016  
CYLINDER NO..... 38671  
LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... 8 psig  
AMBIENT PRESSURE..... 11.4 psi

SAMPLE TEMP..... 125 F  
AMBIENT TEMP..... 57 F

COMMENTS: Separator Gauge Readings: 2 psig. Sample Probe Pressure: 8 psig. IR Gun Surface Temperature: 122-127 F.

**LABORATORY DATA**

COMPONENT	MOLE %	WT%	LV%
METHANE.....	0.1457	0.0082	0.0211
ETHANE.....	0.0000	0.0000	0.0000
PROPANE.....	0.0000	0.0000	0.0000
ISOBUTANE.....	0.0238	0.0049	0.0067
N-BUTANE.....	0.0183	0.0038	0.0049
ISOPENTANE.....	0.0208	0.0053	0.0065
N-PENTANE.....	0.0210	0.0053	0.0065
CYCLOPENTANE.....	0.0166	0.0041	0.0042
N-HEXANE.....	0.4451	0.1350	0.1563
CYCLOHEXANE.....	0.0151	0.0045	0.0044
OTHER HEXANES.....	0.3801	0.1142	0.1260
OTHER HEPTANES.....	0.8601	0.3022	0.3303
METHYLCYCLOHEXANE.....	0.0857	0.0296	0.0294
2,2,4 TRIMETHYLPENTANE.....	0.0000	0.0000	0.0000
BENZENE.....	0.0000	0.0000	0.0000
TOLUENE.....	0.0000	0.0000	0.0000
ETHYLBENZENE.....	0.1682	0.0628	0.0554
XYLENES.....	0.0000	0.0000	0.0000
OTHER OCTANES.....	1.8660	0.7460	0.7865
NONANES.....	2.9058	1.3097	1.3382
DECANES PLUS.....	93.0277	97.2643	97.1237
<b>TOTAL</b>	<b>100.00000</b>	<b>100.00000</b>	<b>100.00000</b>

**SAMPLE FRACTIONS**

	TOTAL	C6+	C10+
SPG LIQUID.....	0.77	0.77	0.90
API GRAVITY.....	52.6	52.6	26.0
MOLECULAR WEIGHT.....	284.1	284.7	297.0
ABSOLUTE DENSITY (lbs/gal).....	6.4	6.4	7.5
HEATING VALUE LIQUID IDL GAS (GBTU/gal).....	31940.6	131244.9	131623.9
GBTU/GAL LIQUID.....	130444.1	130473.1	130579.8
NBTU/GAL LIQUID.....	121264.5	121274.8	142894.4
VAPOR/LIQUID (SCF/gal).....	12.1	12.1	13.9
VAPOR PRESSURE (psia).....	7.4	0.1	0.0

ANALYTICAL PROCEDURES TAKEN FROM ASTM D6730-01(2011), ASTM D7169



**AIR  
POLLUTION  
TESTING, INC.**  
DENVER, SALT LAKE CITY

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Arvada, Colorado 80002  
Phone: 303-420-5949  
Fax: 303-420-5920

**EXTENDED LIQUID ANALYSIS  
DHA COMPONENT ANALYSIS**

**SAMPLE DATA**

PROJECT NO..... LARC6066  
COMPANY NAME..... Arcadis, Inc.  
SITE..... Chatterton  
UNIT ID..... Heater Treater  
SAMPLED BY..... DW

SAMPLE ID..... Pressurized Liquid  
ANALYSIS DATE..... 6/16/2016  
SAMPLE DATE..... 6/15/2016  
CYLINDER NO..... 3B671  
LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... 8 psig  
AMBIENT PRESSURE..... 11.4 psi

SAMPLE TEMP..... 125 F  
AMBIENT TEMP..... 57 F

COMMENTS: Separator Gauge Readings: 2 psig. Sample Probe Pressure: 8 psig IR Gun Surface Temperature: 122-127 F

**LABORATORY DATA**

COMPONENT	MOLE %	WT%	LV%
Methane	0.1457	0.0082	0.0211
Ethane	0.0000	0.0000	0.0000
Propane	0.0000	0.0000	0.0000
Isobutane	0.0238	0.0049	0.0067
n-Butane	0.0183	0.0038	0.0049
Cyclopentane	0.0166	0.0041	0.0042
Isopentane	0.0208	0.0053	0.0065
n-Pentane	0.0210	0.0053	0.0065
Unknown C5s	0.0000	0.0000	0.0000
Neopentane	0.0000	0.0000	0.0000
Benzene	0.0000	0.0000	0.0000
Methylcyclopentane	0.1501	0.0445	0.0453
Cyclohexane	0.0151	0.0045	0.0044
2,2-Dimethylbutane	0.0186	0.0057	0.0066
Neohexane	0.0000	0.0000	0.0000
2-Methylpentane	0.0661	0.0200	0.0234
2,3-Dimethylbutane	0.0000	0.0000	0.0000
3-Methylpentane	0.1453	0.0441	0.0506
Unknown C6s	0.0000	0.0000	0.0000
n-Hexane	0.4451	0.1350	0.1563
Toluene	0.0000	0.0000	0.0000
1,1-Dimethylcyclopentane	0.0000	0.0000	0.0000
1,1-3-Dimethylcyclopentane	0.0000	0.0000	0.0000
1,c-3-Dimethylcyclopentane	0.0271	0.0094	0.0096
1,t-2-Dimethylcyclopentane	0.0412	0.0142	0.0145
Methylcyclohexane	0.0857	0.0296	0.0294
1,c-2-Dimethylcyclopentane	0.0000	0.0000	0.0000
Ethylcyclopentane	0.0949	0.0328	0.0327
Cycloheptane	0.0000	0.0000	0.0000
2,2-Dimethylpentane	0.0106	0.0037	0.0042
2,4-Dimethylpentane	0.0277	0.0098	0.0111
2,2,3-Trimethylbutane	0.0000	0.0000	0.0000
3,3-Dimethylpentane	0.0000	0.0000	0.0000
2-Methylhexane	0.1189	0.0419	0.0472
2,3-Dimethylpentane	0.0967	0.0341	0.0375
3-Methylhexane	0.2177	0.0768	0.0853
3-Ethylpentane	0.0409	0.0144	0.0158
n-Heptane	0.1843	0.0650	0.0726
Triptane	0.0000	0.0000	0.0000
Unknown C7s	0.0000	0.0000	0.0000
Styrene	0.0000	0.0000	0.0000
Ethylbenzene	0.1682	0.0628	0.0554

o-Xylene	0.0000	0.0000	0.0000
m-Xylene	0.0000	0.0000	0.0000
p-Xylene	0.0000	0.0000	0.0000
1,1,3-Trimethylcyclopentane	0.0000	0.0000	0.0000
1,t-2,c-4-Trimethylcyclopentane	0.0447	0.0176	0.0180
1,t-2,c-3-Trimethylcyclopentane	0.0588	0.0232	0.0235
1,c-3-Dimethylcyclohexane	0.0000	0.0000	0.0000
1,t-4-Dimethylcyclohexane	0.0614	0.0242	0.0243
1,1-Dimethylcyclohexane	0.0293	0.0116	0.0113
1-Methyl-c-3-ethylcyclopentane	0.0443	0.0175	0.0173
1-Methyl-t-2-ethylcyclopentane	0.0563	0.0223	0.0221
1,1,2-Trimethylcyclopentane	0.0592	0.0234	0.0231
1,c-2,t-4-Trimethylcyclopentane	0.0000	0.0000	0.0000
1,c-2,t-3-Trimethylcyclopentane	0.0000	0.0000	0.0000
1-Methyl-t-3-ethylcyclopentane	0.0336	0.0133	0.0133
1-Methyl-1-ethylcyclopentane	0.0000	0.0000	0.0000
1,t-3-Dimethylcyclohexane	0.0000	0.0000	0.0000
1,c-4-Dimethylcyclohexane	0.0000	0.0000	0.0000
1,c-2,c-3-Trimethylcyclopentane	0.0773	0.0305	0.0299
Isopropylcyclopentane	0.0000	0.0000	0.0000
1-Ethyl-c-2-methylcyclopentane	0.0000	0.0000	0.0000
1,c-2-Dimethylcyclohexane	0.0000	0.0000	0.0000
n-Propylcyclopentane	0.1512	0.0597	0.0588
Ethylcyclohexane	0.0000	0.0000	0.0000
Cyclooctane	0.0000	0.0000	0.0000
n-Octane	0.2397	0.0964	0.1049
Unknown C8s	0.0000	0.0000	0.0000
Dilsobutyl	0.0000	0.0000	0.0000
Isooctane	0.0000	0.0000	0.0000
2,2,4-Trimethylpentane	0.0000	0.0000	0.0000
2,2-Dimethylhexane	0.0343	0.0138	0.0151
2,4-Dimethylhexane	0.0952	0.0383	0.0417
2,5-Dimethylhexane	0.0000	0.0000	0.0000
2,2,3-Trimethylpentane	0.0000	0.0000	0.0000
3,3-Dimethylhexane	0.0394	0.0159	0.0170
2,3,4-Trimethylpentane	0.0000	0.0000	0.0000
2,3-Dimethylhexane	0.0647	0.0260	0.0279
2-Methylheptane	0.2688	0.1081	0.1182
4-Methylheptane	0.0951	0.0382	0.0414
3-Methylheptane	0.2085	0.0839	0.0907
3,4-Dimethylhexane	0.0000	0.0000	0.0000
3-Ethylhexane	0.2041	0.0821	0.0878
C9	2.9058	1.3097	1.3382
C10	4.6637	2.3358	2.4439
C11	4.5753	2.5175	2.5984
C12	4.4132	2.6463	2.6993
C13	5.1498	3.3422	3.3766
C14	4.9387	3.4491	3.4540
C15	4.6332	3.4645	3.4469
C16	4.1713	3.3252	3.3082
C17	4.1073	3.4768	3.4592
C18	3.9621	3.5496	3.5315
C19	3.7296	3.5255	3.5076
C20	3.4174	3.3991	3.3818
C21	2.7235	2.8434	2.8290
C22	2.9194	3.1921	3.1758
C23	2.3226	2.6541	2.6406
C24	2.1873	2.6076	2.5944
C25	2.0430	2.5364	2.5235
C26	1.7549	2.2653	2.2538
C27	1.7783	2.3834	2.3713
C28	1.4687	2.0409	2.0306
C29	1.3672	1.9674	1.9574
C30+	26.7011	39.7420	39.5399
TOTAL	100.0000	100.0000	100.0000



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EXTENDED LIQUIDS ANALYSIS  
BY CARBON NUMBER

**SAMPLE DATA**

PROJECT NO..... LARC6066  
COMPANY NAME..... Arcadis Inc.  
SITE..... Chatterton  
UNIT ID..... Heater Treater  
SAMPLED BY..... DW

SAMPLE ID..... Pressurized Liquid  
ANALYSIS DATE..... 6/16/2016  
SAMPLE DATE..... 6/15/2016  
CYLINDER NO..... 38671  
LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... 8 psig  
AMBIENT PRESSURE..... 11.4 psi

SAMPLE TEMP..... 125 F  
AMBIENT TEMP..... 57 F

COMMENTS: Separator Gauge Readings: 2 psig. Sample Probe Pressure: 8 psig. IR Gun Surface Temperature: 122-127 F

**LABORATORY DATA**

COMPONENT	MOLE %	WT%	LV%
C1	0.1457	0.0082	0.0211
C2	0.0000	0.0000	0.0000
C3	0.0000	0.0000	0.0000
C4	0.0421	0.0086	0.0116
C5	0.0584	0.0147	0.0172
C6	0.8403	0.2537	0.2866
C7	0.9458	0.3318	0.3597
C8	2.0342	0.8088	0.8419
C9	2.9058	1.3097	1.3382
C10	4.6637	2.3358	2.4439
C11	4.5753	2.5175	2.5984
C12	4.4132	2.6463	2.6993
C13	5.1498	3.3422	3.3766
C14	4.9387	3.4491	3.4540
C15	4.6332	3.4645	3.4469
C16	4.1713	3.3252	3.3082
C17	4.1073	3.4768	3.4592
C18	3.9621	3.5496	3.5315
C19	3.7296	3.5255	3.5076
C20	3.4174	3.3991	3.3818
C21	2.7235	2.8434	2.8290
C22	2.9194	3.1921	3.1758
C23	2.3226	2.6541	2.6406
C24	2.1873	2.6076	2.5944
C25	2.0430	2.5364	2.5235
C26	1.7549	2.2653	2.2538
C27	1.7783	2.3834	2.3713
C28	1.4687	2.0409	2.0306
C29	1.3672	1.9674	1.9574
C30+	26.7011	39.7420	39.5399
TOTAL	100.0000	100.0000	100.0000

The following files were used in generating this report:  
C:\Chem32\2\DATA\IDHA\38529\_06202016\_0853.csv  
C:\AscentSimdistOutput\Chatterton\_06202016.csv



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Arvada, Colorado 80002  
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PHYSICAL PROPERTY TESTING

**SAMPLE DATA**

PROJECT NO..... LARC6066  
COMPANY NAME..... Arcadis, Inc.  
SITE..... Chatterton  
UNIT ID..... Tank  
SAMPLED BY..... DW

SAMPLE ID..... Sales Oil  
ANALYSIS DATE..... 6/16/2016  
SAMPLE DATE..... 6/15/2016  
CYLINDER NO..... Jar  
LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... NA  
AMBIENT PRESSURE..... 11.4 psi

SAMPLE TEMP..... NA  
AMBIENT TEMP..... 57 F

COMMENTS:

**LABORATORY DATA**

API GRAVITY = 22.0

REID VAPOR PRESSURE = 0.78 psi

NOTES: API GRAVITY MEASURED USING ASTM D6377/D6378

VAPOR PRESSURE MEASURED USING ASTM D1298/D287



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**FLASH LIBERATION ANALYSIS OF SEPARATOR LIQUID**

**SAMPLE DATA**

PROJECT NO..... LARC6066  
COMPANY NAME..... Arcadis, Inc.  
SITE..... Chatterton  
UNIT ID..... FWKO #2  
SAMPLED BY..... DW

SAMPLE ID..... Produced Water  
ANALYSIS DATE..... 6/14/2016  
SAMPLE DATE..... 6/9/2016  
CYLINDER NO..... 40048  
LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... 30 psig  
AMBIENT PRESSURE..... 11.4 psi

SAMPLE TEMP..... 80 F  
AMBIENT TEMP..... 76 F

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Flash Liberation of Hydrocarbon Liquid**

	Pressure	Temperature
Separator Produced Water	30 psig	80 °F
Stock Tank	0 psig	70 °F
Base Conditions	14.65 psi	60 °F

**Flash Liberation Results**

	Result	Units
Gas Water Ratio	1.3	SCF flashed gas/bbl stock tank liquid
Gas Specific Gravity	1.2978	Air = 1.00



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Arvada, Colorado 80002  
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Flashed Gas Extended Analysis

**SAMPLE DATA**

PROJECT NO..... LARC6066  
COMPANY NAME..... Arcadis, Inc.  
SITE..... Chatterton  
UNIT ID..... FWKO #2  
SAMPLED BY..... DW

SAMPLE ID..... Flashed Gas  
ANALYSIS DATE..... 8/14/2016  
SAMPLE DATE..... 8/9/2016  
CYLINDER NO..... 40048  
LAB ANALYST..... CB

**LAB CONDITIONS**

PRESSURE..... 12.2 psi

TEMPERATURE..... 70 F

COMMENTS:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**LABORATORY DATA**

COMPONENT	MOLE %	WT%	GPM
HYDROGEN SULFIDE.....	8.8573	8.0306	1.2007
CARBON DIOXIDE.....	47.8890	56.0685	8.1950
NITROGEN.....	22.5061	16.7727	2.4828
METHANE.....	16.0624	6.8552	2.7305
ETHANE.....	0.3573	0.2858	0.0958
PROPANE.....	0.2033	0.2385	0.0562
ISOBUTANE.....	0.0420	0.0649	0.0138
N-BUTANE.....	0.1670	0.2583	0.0528
ISOPENTANE.....	0.0630	0.1210	0.0231
N-PENTANE.....	0.0883	0.1695	0.0321
CYCLOPENTANE.....	0.0000	0.0000	0.0000
N-HEXANE.....	0.1459	0.3346	0.0602
CYCLOHEXANE.....	0.0284	0.0637	0.0097
OTHER HEXANES.....	0.1299	0.2979	0.0536
HEPTANES.....	0.0000	0.0000	0.0000
METHYLCYCLOHEXANE.....	0.0254	0.0663	0.0102
2,2,4 TRIMETHYLPENTANE.....	0.0000	0.0000	0.0000
BENZENE.....	0.0222	0.0460	0.0062
TOLUENE.....	0.0706	0.1731	0.0237
ETHYLBENZENE.....	0.0000	0.0000	0.0000
XYLENES.....	0.0086	0.0244	0.0034
C8+ HEAVIES.....	3.3331	10.1290	1.7112
SUBTOTAL	100.0000	100.0000	16.7610
OXYGEN/ARGON	0.0000	0.0000	0.0000
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>16.7610</b>

**BTU @**

MOLECULAR WEIGHT.....	37.5892	NET DRY REAL	432.5308 /scf
RELATIVE DENSITY (AIR=1).....	1.2978		
COMPRESSIBILITY FACTOR.....	0.9947	GROSS DRY REAL	473.9190 /scf
		GROSS WET REAL	465.8531 /scf

Arcadis U.S., Inc.

1717 West 6th Street

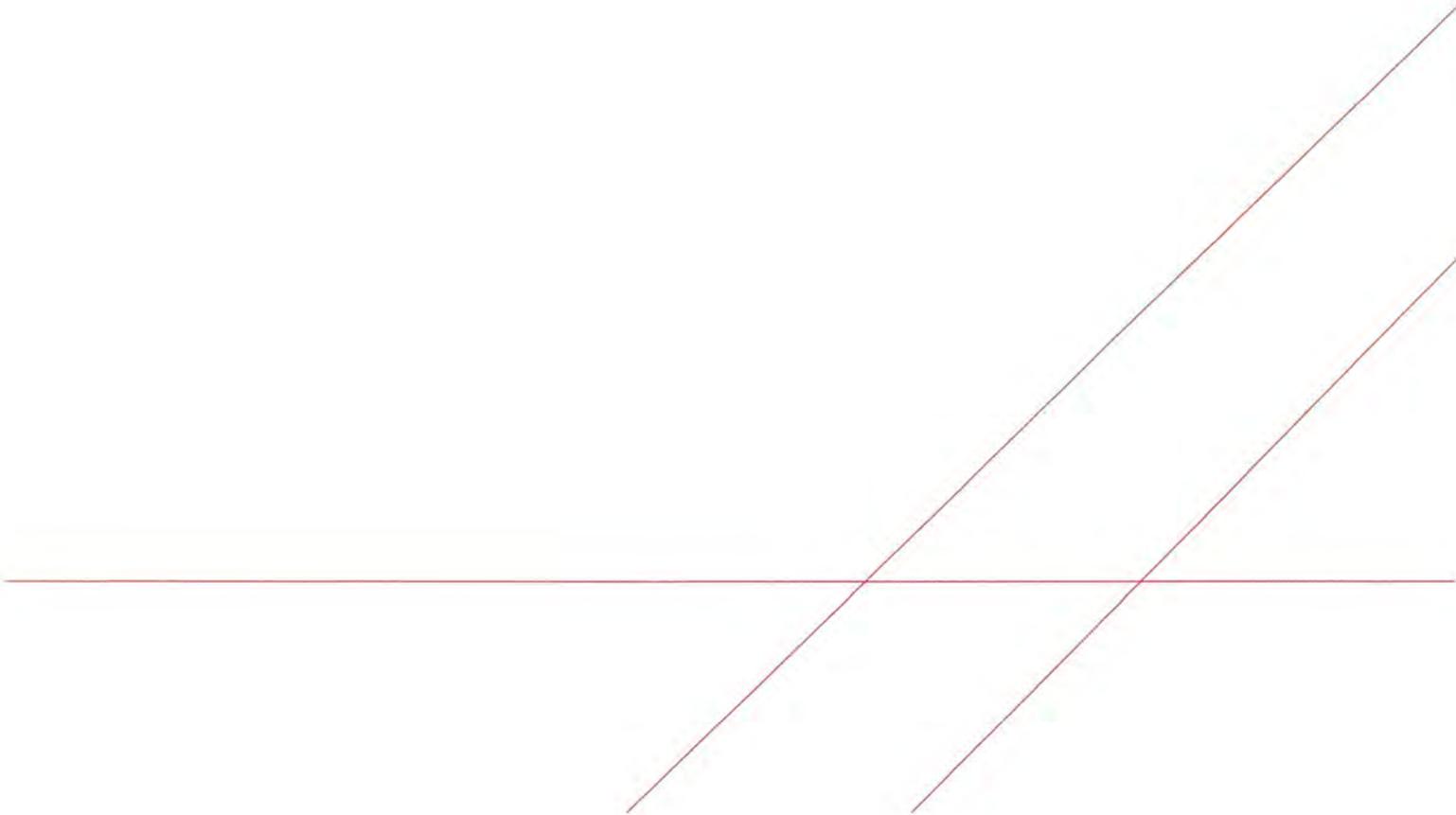
Suite 210

Austin, Texas 78703

Tel 512 451 1188

Fax 512 451 2930

[www.arcadis.com](http://www.arcadis.com)



REG-WR-000011-2016.001  
(SMNSR withdrawn)

Marathon Oil  
1501 Stampede Avenue  
Cody, WY 82414



September 12, 2016



Claudia Young Smith  
Air Program, Mail Code 8P-AR  
US Environmental Protection Agency, Region 8  
1595 Wynkoop Street  
Denver, CO 80202

Certified Mail: 7014 2870 0002 2285 6512

Dean Goggles  
Wind River Environmental Quality Commission  
PO Box 217  
Fort Washakie, WY 82514

Certified Mail: 7005 1820 0001 1074 2835

RE: Maverick Springs Tank Battery Tribal Minor New Source Review Registration Application

Dear Ms. Smith,

Marathon Oil Company (Marathon), is submitting the enclosed Tribal Minor New Source Review (NSR) Registration to certify emissions at the Maverick Springs Tank Battery (Facility), located on the Wind River Indian Reservation in Wyoming. Due to the changes described in this letter, Marathon has determined that the facility no longer requires a synthetic minor permit and requests that the application for a synthetic minor permit submitted in May 2016 be withdrawn.

The Facility is an existing Oil and Gas Production Facility, and will have an uncontrolled potential to emit (PTE) for regulated air pollutants below the major source thresholds as defined in 40 CFR § 49.167 and § 52.21, but a PTE for Volatile Organic Compounds (VOCs) and Hydrogen Sulfide (H<sub>2</sub>S) above the minor NSR thresholds as defined in Table 1 of 40 CFR § 49.153. As such, the Facility requires a registration pursuant to 40 CFR § 49, Subpart C, Section § 49.160. A tribal minor synthetic minor application was submitted to the EPA Region 8 in May 2016, but the Facility has not been previously registered with the EPA Region 8.

Marathon is submitting the enclosed Tribal Minor NSR Registration as a result of new analysis data for produced liquid and gas. In order to more accurately quantify emissions from the Facility, Marathon collected site-specific oil, produced water, and produced gas samples in June 2016. Laboratory analyses from site-specific samples have allowed Marathon to quantify emissions based off of a measured Gas-to-Oil Ratio (GOR), a measured Gas-to-Water Ratio (GWR), measured H<sub>2</sub>S concentrations, and a produced gas analysis. Previous PTE determinations submitted in the May 2016 synthetic minor application for the Facility were conservatively based off of an assumed GWR and GOR from a Gas Emulsion Ratio (GER), and were based on representative analyses. As such, the revised PTE based on site-specific analysis more accurately represents facility operations. The PTE represented in the enclosed registration reflects the maximum throughput capacity for the Facility.

Enclosed with this letter are the form REG, and all applicable components required for the Tribal Minor NSR Registration Application. If you have any questions regarding this submittal,

Maverick Springs Tank Battery  
Tribal New Source Review Registration Application  
September 12, 2016  
Page | 2

please feel free to contact Donna Stevison at [dmstevison@marathonoil.com](mailto:dmstevison@marathonoil.com) or at (307) 254-2760.

Sincerely,

A handwritten signature in blue ink, appearing to read "Jon F. Salomonsen". The signature is fluid and cursive, with the first name "Jon" being particularly prominent.

Jon F. Salomonsen  
Operations Manager

Enclosure: EPA Region 8 Tribal New Source Review Registration Application, Maverick Springs Battery

Marathon Oil Company



# **APPLICATION FOR EPA REGION 8 TRIBAL MINOR NEW SOURCE REVIEW REGISTRATION**

Maverick Springs Tank Battery

Oil and Gas Production Facility

September 2016

FEDERAL NEW SOURCE REVIEW  
APPLICATION FOR TRIBAL MINOR  
NEW SOURCE REVIEW  
REGISTRATION

Marathon Oil, Company

Oil and Gas Production Facility

Prepared for:

Marathon Oil Company (Marathon)

1501 Stampede Ave # 9019

Cody, WY 82414

Prepared by:

Arcadis U.S., Inc.

11001 West 120th Avenue

Suite 200, Eldorado Building

Broomfield

Colorado 80021

Tel 303 544 0043

Fax 720 887 6051

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## ACRONYMS AND ABBREVIATIONS

40 CFR	Title 40 of the United States Code of Federal Regulations
AP-42	EPA's AP-42, Compilation of Air Pollutant Emission Factors, Fifth Edition
bbf	Barrel
BOPY	Barrels of Oil per Year
BRE	Bryan Research & Engineering
BWPD	Barrels of Water per Day
CAA	Clean Air Act
DRE	Destruction and Removal Efficiency
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FIP	Federal Implementation Plan
GPM	Gallons per Minute
H <sub>2</sub> S	Hydrogen Sulfide
HAP	Hazardous Air Pollutant
lb	Pound
lb-mol	Pound-Mole
MACT	Maximum Achievable Control Technology
Marathon	Marathon Oil Company
MSS	Maintenance, Startup, and Shutdown
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NO <sub>x</sub>	Oxides of Nitrogen
NSPS	New Source Performance Standards
NSR	New Source Review
ppmv	Parts per Million by Volume
PSD	Federal Clean Air Act, Part C
psia	Pounds per Square Inch (absolute)
psig	Pounds per Square Inch (gauge)
RVP	Reid Vapor Pressure
SO <sub>2</sub>	Sulfur Dioxide
tpy	Tons per Year
VOC	Volatile Organic Compound

# 1 INTRODUCTION

Marathon Oil Company (Marathon) owns and operates the oil and gas production facility known as the Maverick Springs Tank Battery (Facility). The Facility is located in Fremont County, Wyoming on the Wind River Indian Reservation. The Facility is an oil and gas production facility subject to Federal Implementation Plan (FIP) for under 40 CFR §49.151, Subpart C [See 40 CFR §49.153(c)]. Further, Fremont County is designated as attainment/unclassifiable for all criteria pollutants. As such, the Facility is required to comply with the Clean Air Act (CAA) under the permitting authority of the Environmental Protection Agency (EPA) Region 8 Federal Minor New Source Review Program in Indian Country under 40 CFR §49, Subpart C.

Marathon respectfully submits this application for a Tribal NSR Registration in EPA Region 8 in accordance with 40 CFR §49.160 to emit regulated air pollutants. With the issuance of the registration, the Facility will have a potential to emit (PTE) for regulated air pollutants below the major source thresholds as defined in 40 CFR §49.167 and §52.21, but will have a PTE for Volatile Organic Compounds (VOCs) and Hydrogen Sulfide (H<sub>2</sub>S) air pollutants above the minor NSR thresholds as defined in Table 1 of 40 CFR §49.153. The Facility is an oil and gas production facility. Therefore, it is not a listed source category under 40 CFR §52.21(b)(1) and would be considered a major source if the PTE of any criteria pollutant is greater than or equal to 250 tons per year (tpy). As summarized in Table 3-1, the PTE, calculated as defined in 40 CFR §49.152 and 40 CFR §52.21(b)(1) for non-named sources, for each criteria pollutant is less than 250 tpy. Federal major new source review and prevention of significant deterioration (PSD) review are not triggered.

Additionally, Title V permitting requirements will not be triggered since the Title V major source thresholds, as defined in 40 CFR §71.2, are not exceeded: 100 tpy for each criteria pollutant, 25 tpy for total hazardous air pollutants (HAPs), 10 tpy for any single HAP.

This report includes all required elements for a Tribal NSR Registration application defined in 40 CFR §49.160. As applicable, this information is provided on the required Tribal NSR Registration application materials including the FORM REG, provided in Appendix C.

## 2 PROCESS DESCRIPTION AND PROCESS FLOW DIAGRAM

The Maverick Springs Tank Battery will operate 24 hours a day, 7 days a week, and 52 weeks a year, for a total annual hours of 8,760. The facility is requesting to handle up to 1,800-bbl per day of crude oil (BOPD), 77,763-bbl per day of produced water (BWPD).

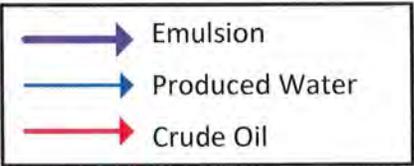
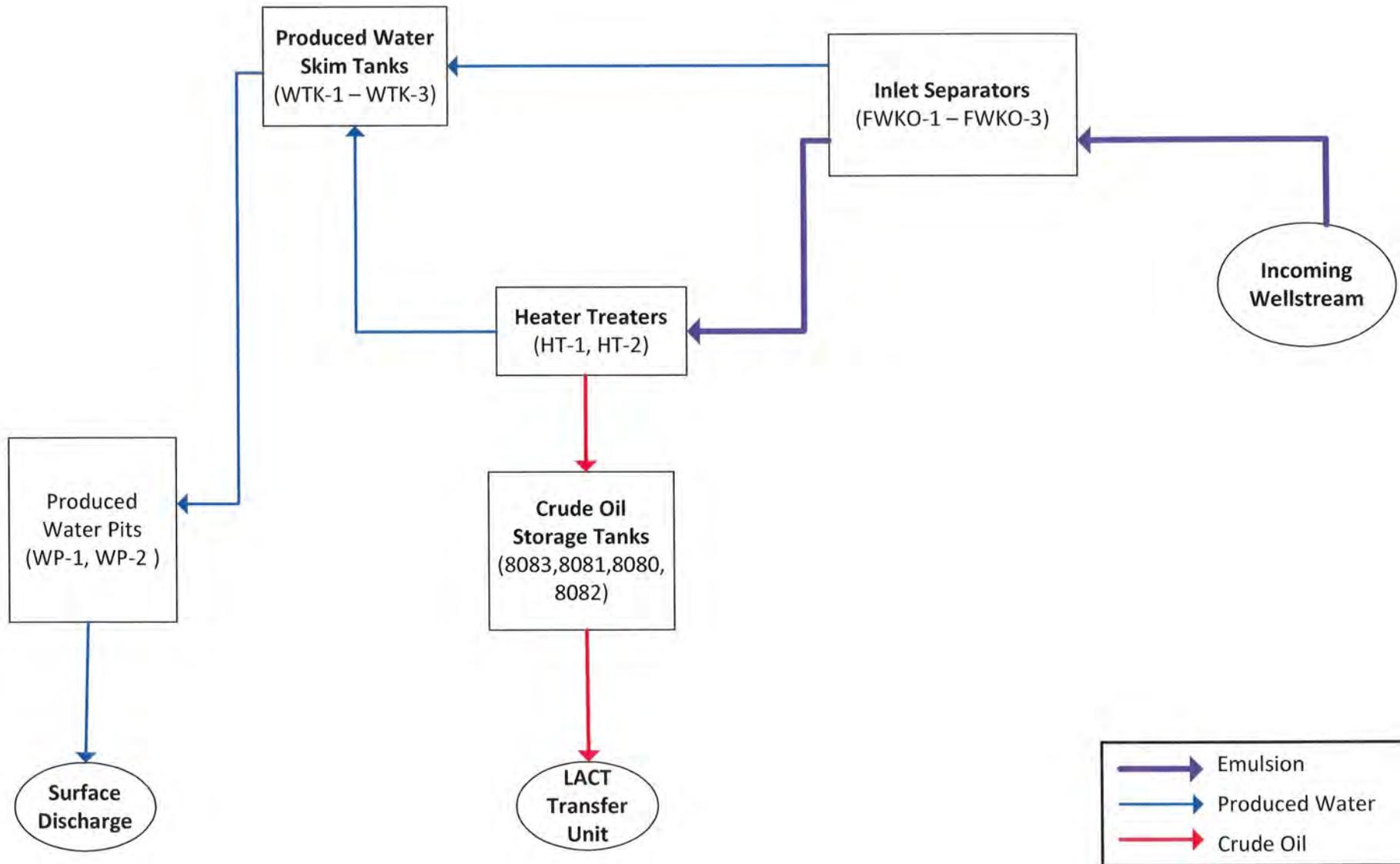
Production from the wells enters the Maverick Springs Tank Battery through four inlet free water knockouts (FWKO). From the FWKOs, the oil/gas emulsion is sent to two heater treaters (HT-1 & HT-2) for secondary separation of the gas, oil and produced water. The produced water that is separated from the FWKOs and the heater treaters, is then routed to three 1,000-bbl produced water skim tanks (WTK-1, WTK-2 & WTK-3). Vapors from the three skim tanks are vented to atmosphere. After the produced water enters the skim tanks, it is sent to two open water pits, where it is released via surface water discharge.

Produced gas that is flashed off of the heater treaters (HT-1 & HT-2) is vented to atmosphere. Oil that is separated out of the heater treaters is sent to a 300 barrel (bbl) crude oil run tank (Run Tank 8083) before it is routed to a lease-activated custody transfer (LACT) Unit and then to the sales pipeline. During non-normal operating conditions, reject or overflow oil will be directed to either a 300 bbl reject oil tank (Reject Tank 8080), or a 300 bbl overflow (Overflow Tank 8081) tank. An additional 300 bbl steamer tank is on-site and is used in non-normal operating conditions (Slop Oil Tank 8082). Vapors from the crude oil run tank and all other storage tanks will vent to atmosphere.

The produced gas from the Facility contains up to 35,600 parts per million (ppm) H<sub>2</sub>S. A process flow diagram for the Facility is provided in Figure 2-1. A summary of the equipment at the Facility is presented in Table 2-1.

Table 2-1. Summary of Equipment

Equipment ID	Equipment Description	Capacity/Design Rate	Controls
FUG-1	Fugitive Emissions	N/A	None
Run Tank 8083	Crude Oil Sales Tank	300 bbl	None
Overflow Tank 8081	Crude Oil Overflow Tank	300 bbl	None
Reject Tank 8080	Crude Oil Reject Tank	300 bbl	None
Slop Oil Tank 8082	Crude Oil Slop Tank	300 bbl	None
WTK-1	Produced Water Skim Tank	1,000 bbl	None
WTK-2	Produced Water Skim Tank	1,000 bbl	None
WTK-3	Produced Water Skim Tank	1,000 bbl	None
HT-1	Heater Treater #1	N/A	None
HT-2	Heater Treater #2	N/A	None
B-1	Heater Treater Burner #1	1 MMBtu/hr	None
B-2	Heater Treater Burner #2	1 MMBtu/hr	None
MSS-DEGAS	Tank Degassing	N/A	None



**PROCESS FLOW DIAGRAM  
Maverick Springs Tank Battery**

MARATHON OIL EF LLC – Fremont County, WY

Prepared by: **ARCADIS** September 2016

## 3 EMISSIONS SUMMARY

The maximum uncontrolled PTE air pollutant emission rates proposed for each emission source at the Facility are presented in Table 3-1, and the actual air pollutant emission rates, based off of 2015 production data, are presented in Table 3-2. Detailed emission calculations for the proposed equipment and operations are presented in Appendix A for the PTE and Appendix B for actual 2015 production.

### 3.1 Emissions Calculations

Emissions of Volatile Organic Compounds (VOCs) from material phase changes such as flashing, and tank losses were calculated using the ProMax Process Simulator published by Bryan Research and Engineering (BRE). The process simulator emission calculation tables are provided in Appendix A for the PTE, and Appendix B for actual 2015 production.

#### 3.1.1 Gas and Liquid Analyses

The composition and physical properties of the crude oil were taken from an extended oil analysis of oil that was collected from the outlet of the heater treaters. The produced gas properties were taken from a produced gas sample, as well as oil and produced water flash liberation analyses, which were collected at the storage tanks. Laboratory analyses are provided in Appendix D.

#### 3.1.2 Storage Tank Emissions

Emissions of volatile organic compounds (VOC), H<sub>2</sub>S, and hazardous air pollutants (HAP) from the oil and water storage tanks were estimated using BRE ProMax Process Simulator (ProMax). This model accounts for flash emissions resulting from the change in liquid stream pressure from the separator to ambient conditions and the working and breathing losses. The emissions are based on the maximum annual capacity production rates for oil and water, design operating pressure and temperature of separators, and the material analyses as discussed in Section 3.1.1. Some flashing emissions from the crude oil and produced gas were accounted for at the heater treaters (HT-1 & HT-2), and will vent to atmosphere. Working, breathing, and additional flashing emissions from the produced water and crude oil tanks are based on the maximum storage tank liquid surface temperature obtained from AP-42, Chapter 7.1 for Cheyenne, Wyoming. Emissions from the three 1,000-bbl produced water skim tanks (WTK-1 - WTK-3) are not controlled and vent to atmosphere.

All crude oil that is routed to the sales pipeline flows through the 300-bbl crude oil run tank (Run Tank 8083). The 300-bbl reject tank (Reject Tank 8080), 300-bbl overflow tank (Overflow Tank 8081), and 300-bbl slop tank (Slop Oil Tank 8082) are not used during normal operating conditions. The overflow tank and the slop tank are used for maintenance and upset conditions, and the reject oil tank is used for the storage & recycling of oil that cannot be sent to sales. Volumes of oil sent to the overflow, reject and slop tanks represent maximum actual volumes for an entire year. Emissions from crude oil storage tanks are not controlled, and will vent to atmosphere.

Detailed process streams provided by ProMax, and emission calculations are presented in Appendix A for the PTE, and Appendix B for actual 2015 production.

### **3.1.3 Fugitive Emissions**

Fugitive emissions (FUG-1) from equipment leaks are estimated using emission factors for oil and gas production facilities from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4. No control efficiency is applied to the emissions. Total fugitive component counts are based on equipment counts at the Facility and default average component counts for major natural gas production equipment (40 CFR Part 98, Subpart W, Table W-1B) and for major crude oil production equipment (40 CFR Part 98, Subpart W, Table W-1C).

### **3.1.4 External Combustion Unit Emissions**

The heater treater burners (B-1 & B-2) at the Facility are fueled by propane. Emissions from the heater treaters were estimated using emission factors from USEPA AP-42 Chapter 1.5 Liquefied Petroleum Gas (LPG) Combustion, dated July 2008 for small boilers, the maximum design heat input rating, and annual hours of operation. Total annual propane usage for each heater will be 95,738 gallons.

### **3.1.5 Greenhouse Gas Emissions**

Greenhouse Gas (GHG) emissions from the storage tanks at the Facility were calculated for carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) from mass balances. GHG emissions from the external combustion units were estimated using GHG factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion. Equivalent carbon dioxide emissions (CO<sub>2</sub>e) were estimated based on individual GHG emissions and the Global Warming Potentials (GWP) provided in 40 CFR Part 98, Subpart A, Table A-1.

## **3.2 Maintenance, Startup and Shutdown (MSS)**

In addition to the normal operation emission sources, Marathon is requesting to include the following planned MSS operations into the total annual emissions for the Facility:

- Tank Vent Degassing (MSS-DEGAS);

Tank Vent Degassing Losses were estimated for each of the storage tanks at the Facility, and the emissions are uncontrolled. Crude oil tanks are cleaned once per year assuming each tank takes one hour to clean. The Produced water tank is also cleaned once per year, assuming the tank takes twelve hours to clean. Tanks operate at atmospheric conditions. Degassing emissions are based on the ideal gas law.

Marathon Oil , LLC  
Maverick Springs  
Emissions Summary

Table 3-1. Uncontrolled PTE Maximum Air

Emission Source	Benzene		HAP	
	lbs/hr	tpy	lbs/hr	tpy
Fugitive Emissions	2.27E-04	9.92E-04	0.59	2.58
Crude Oil Sales Tank	5.88E-05	6.22E-05	0.15	0.19
Crude Oil Overflow Tank	3.63E-06	1.59E-05	0.03	0.05
Crude Oil Reject Tank	7.06E-07	3.09E-06	2.23E-03	0.01
Crude Oil Slop Tank	7.06E-07	3.09E-06	2.23E-03	0.01
Produced Water Skim Tank	1.67E-04	3.03E-04	0.04	0.13
Produced Water Skim Tank	1.67E-04	3.03E-04	0.04	0.13
Produced Water Skim Tank	1.67E-04	3.03E-04	0.04	0.13
Heater Treater Produced Gas	1.67E-04	7.32E-04	0.42	1.84
Heater Treater Produced Gas	1.67E-04	7.32E-04	0.42	1.84
Heater Treater Burner	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Heater Treater Burner	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Tank Degassing	3.53E-05	1.76E-08	0.11	5.57E-05
	<b>1.16E-03</b>	<b>3.45E-03</b>	<b>1.83</b>	<b>6.91</b>
<b>MAXIMUM</b>	<b>Year</b>	<b>8760</b>		

Marathon Oil Company  
Maverick Springs  
Emissions Summary

Table 3-2. Actual Air Pollutant Emission R

Emission Source	Benzene		HAP	
	lbs/hr	tpy	lbs/hr	tpy
Fugitive Emissions	3.90E-04	1.71E-03	0.51	2.24
Crude Oil Sales Tank	5.17E-05	1.01E-04	0.07	0.16
Crude Oil Overflow Tank	7.71E-06	3.38E-05	0.03	0.05
Crude Oil Reject Tank	1.48E-06	6.46E-06	2.35E-03	0.01
Crude Oil Slop Tank	1.48E-06	6.46E-06	2.35E-03	0.01
Produced Water Skim Tank	2.42E-04	4.24E-04	0.02	0.09
Produced Water Skim Tank	2.42E-04	4.24E-04	0.02	0.09
Produced Water Skim Tank	2.42E-04	4.24E-04	0.02	0.09
Heater Treater Produced Gas	2.57E-04	1.12E-03	0.32	1.42
Heater Treater Produced Gas	2.57E-04	1.12E-03	0.32	1.42
Heater Treater Burner	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Heater Treater Burner	2.30E-08	1.01E-07	2.06E-05	9.04E-05
Tank Degassing	3.64E-05	3.32E-08	0.11	5.29E-05
	1.76E-03	0.01	1.45	5.58
MAXIMUM	Year	8760		

## 4 COMPLIANCE WITH FEDERAL PERMITTING REQUIREMENTS

A summary of compliance with applicable federal requirements, including applicable NSPS regulations is provided in Tables 4-1.

Table 4-1. Federal Standard Applicability

Federal Standard	Name	Applicability
<b>NSPS</b>		
NSPS OOOO	Standards of Performance for Crude Oil and Natural Gas Production, Transmission and Distribution	This subpart establishes standards for emission sources at oil and gas production facilities that were constructed after August 23, 2011.  <i>All produced water and oil storage tanks were constructed prior to August 23, 2011 and have an annual PTE less than 6 tpy, therefore do not meet the applicability provisions of 40 CFR §60.5365. NSPS OOOO is not applicable.</i>
NSPS Kb	Standards of Performance for Storage Vessels for Petroleum Liquids for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984	This subpart applies to storage vessels containing volatile organic liquids with either a capacity greater than 75 m <sup>3</sup> (470 bbl) with a maximum true vapor greater than 76.6 kPa (11.1 psi) or greater than 151 m <sup>3</sup> (950 bbl) with a maximum true vapor pressure greater than 3.5 kPa (0.5 psi).  <i>The Facility is exempt from the requirements of NSPS Kb under exemption §60.110b (d)(4) for vessels with a design capacity <u>less than or equal</u> to 1,589.874 m<sup>3</sup> used for petroleum or condensate stored, processed, or treated prior to custody transfer. NSPS Kb is not applicable.</i>

# APPENDIX A

Emissions Calculations- Uncontrolled PTE Emissions



**Marathon Oil , LLC  
Maverick Springs  
Facility Information**

<b><u>Oil and Gas Site General Information</u></b>	
<b><u>Administrative Information</u></b>	
Company Name	Marathon Oil , LLC
Facility/Well Name	Maverick Springs
Nearest City/Town	Riverton
County	Fremont

<b><u>Technical Information</u></b>	
Produced Gas Site Throughput (MMSCF/day):	0.06
Produced Gas Site Throughput (MMSCF/year):	23.09
Oil/Condensate Site Throughput (bbl/day):	1,800
Oil/Condensate Site Throughput (bbl/year):	657,000
Produced Water Site Throughput (bbl/day):	77,763
Produced Water Site Throughput (bbl/year):	28,383,495
Are there any sour gas streams at this site?	Yes
Gas H2S Concentration (ppm)	35,600
Has this site been registered before?	Yes

<b><u>Equipment/Process Types</u></b>	<b><u>How many for this project?</u></b>
Fugitives	NO
IC Engines	0
Turbines	0
Compressors (electric)	0
Diesel Engines	0
Heaters-Boilers	2
Separators	5
Oil / Condensate Tanks	4
Produced Water Tanks	4
Miscellaneous Tanks	3
Loading Jobs	0
Glycol Units	0
Amine Units	0
Vapor Recovery Units	0
Flares-Vapor Combustors	0
Thermal Oxidizers	0
MSS	YES



Marathon Oil, LLC  
Maverick Springs  
Fugitive Emissions

**Background Information**

Total fugitive component counts are based on equipment counts at the facility and default average component counts for major crude oil production equipment (40 CFR Part 98, Subpart W, Table W-1C) and major onshore natural gas production equipment (40 CFR Part 98, Subpart W, Table W-1B). Since both light oil and gas components are present at the facility, the emissions assume the maximum component emission factor.

**Component Count for Oil Production**

Major equipment	Valves	Flanges	Connectors	Open-ended lines	Other components
Wellhead	5	10	4	0	1
Separator	6	12	10	0	0
Meters/piping	0	0	0	0	0
Heater-treater	8	12	20	0	0
Header	5	10	4	0	0
In-line heaters	0	0	0	0	0
Dehydrators	0	0	0	0	0
Compressors	0	0	0	0	0

**Component Count for Gas Production (Western US)**

Major equipment	Valves	Flanges	Connectors	Open-ended lines	Other components
Wellhead	11	0	36	1	0
Separators	34	0	106	6	2
Meters/piping	14	0	51	1	1
Heater-treater	0	0	0	0	0
Header	0	0	0	0	0
In-line heaters	14	0	65	2	1
Dehydrators	24	0	90	2	2
Compressors	73	0	179	3	4

**Facility Equipment Counts**

Major equipment	Gas Production	Oil Production
Wellhead	0	0
Separator	3	2
Meters/piping	0	2
Heater-treater	N/A	2
Header	0	1
In-line heaters	0	N/A
Dehydrators	0	N/A
Compressors	0	N/A

Component Service	Component Counts - MRR Approach				
	Valve	Flanges	Connectors	Open-Ended Line	Other Components
Gas Service	102	0	318	18	6
Light Oil Service	33	58	64	0	0

**Emissions Estimate**

Liquid Equipment/Service	Oil and Gas Production Operations Emission Factor <sup>a</sup> (Light Oil)	Oil and Gas Production Operations Emission Factor <sup>a</sup> (Gas)	# Light Oil Components	# Gas Components	Short-Term TOC Emissions <sup>b</sup>	Annual TOC Emissions <sup>c</sup>
	(lb TOC/hr/component)	(lb TOC/hr/component)			(lb/hr)	(ton/yr)
Valves	0.0055	0.00992	33	102	1.19	5.23
Flanges	0.000243	0.00086	58	0	0.01	0.06
Open-Ended Lines	0.00309	0.00441	0	18	0.08	0.35
Connectors	0.000463	0.00044	64	318	0.17	0.74
Other	0.0165	0.0194	0	6	0.12	0.51
<b>Total</b>					<b>1.57</b>	<b>6.89</b>

<sup>a</sup> Emission factors are for oil and gas production facilities (not refineries) come from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4.

<sup>b</sup> Controlled Short-Term ER (lb/hr) = (100% - Reduction Factor) \* Σ(Number of Components \* Emissions Factor [lb/hr/component]).

<sup>c</sup> Controlled Annual ER (tpy) = Controlled Short-Term ER (lb/hr) \* 8,760 (hr/yr) / 2,000 (lb/ton).

<sup>d</sup> No reduction from LDAR monitoring is being claimed.

Marathon Oil, LLC  
Maverick Springs  
Fugitive Emissions

Speciated Fugitive Emissions\*

Component	Light Oil (lb/hr)	Light Oil (ton/year)	Gas (lb/hr)	Gas (ton/year)	Total (lb/hr)	Total (ton/year)
Nitrogen	0.16	0.69	8.16	35.75	8.32	36.44
CO <sub>2</sub>	1.52	6.65	5.40	23.63	6.91	30.28
Methane	0.30	1.32	2.98	13.05	3.28	14.36
Ethane	0.12	0.51	0.27	1.18	0.39	1.69
Propane	0.04	0.17	0.13	0.57	0.17	0.74
Isobutane	4.53E-03	0.02	0.02	0.08	0.02	0.10
n-Butane	0.01	0.03	0.03	0.14	0.04	0.18
Isopentane	0.01	0.03	0.03	0.14	0.04	0.18
n-Pentane	3.12E-03	0.01	0.02	0.07	0.02	0.08
i-C6	0.05	0.23	0.30	1.32	0.35	1.55
n-Hexane	0.08	0.37	0.49	2.17	0.58	2.54
Benzene	2.71E-05	1.19E-04	1.99E-04	8.74E-04	2.27E-04	9.92E-04
Cyclohexane	7.74E-04	3.39E-03	4.46E-03	0.02	0.01	0.02
i-C7	0.01	0.03	0.15	0.65	0.16	0.68
n-Heptane	--	--	--	--	--	--
Toluene	3.57E-05	1.56E-04	2.90E-04	1.27E-03	3.26E-04	1.43E-03
2,2,4-Trimethylpentane	9.95E-05	4.36E-04	6.92E-04	3.03E-03	7.92E-04	3.47E-03
n-Octane	0.01	0.05	0.11	0.47	0.12	0.52
Ethylbenzene	2.31E-04	1.01E-03	2.06E-03	0.01	2.29E-03	0.01
m-Xylene	8.95E-04	3.92E-03	0.01	0.03	0.01	0.03
3-Methyloctane	--	--	--	--	--	--
n-Nonane	4.66E-03	0.02	0.05	0.23	0.06	0.25
H-S	0.62	2.72	1.56	6.85	2.18	9.57
Water	4.89E-05	2.14E-04	0.27	1.17	0.27	1.17
C10+	1.49E-05	6.53E-05	2.24E-04	9.80E-04	2.39E-04	1.05E-03
<b>Total</b>	<b>2.94</b>	<b>12.88</b>	<b>19.98</b>	<b>87.53</b>	<b>22.92</b>	<b>100.41</b>
<b>TOC</b>	<b>0.64</b>	<b>2.81</b>	<b>4.60</b>	<b>20.13</b>	<b>5.24</b>	<b>22.94</b>
<b>VOC</b>	<b>0.23</b>	<b>0.99</b>	<b>1.35</b>	<b>5.90</b>	<b>1.57</b>	<b>6.89</b>
<b>Total HAP</b>	<b>0.09</b>	<b>0.38</b>	<b>0.50</b>	<b>2.21</b>	<b>0.59</b>	<b>2.58</b>

\* Fugitive oil emissions speciation is based on the crude oil tank W&B vapors. Fugitive gas emissions speciation is based on sales gas stream.

Marathon Oil, LLC  
Maverick Springs  
Heater Treater Produced Gas

<b>Identification</b>		
Emission Source	HT-1-HT-2	
Produced Gas Throughput (MMscfd)	0.0449	
Produced Gas Throughput (MMscf/yr)	16.37	
<b>Heater Treater Operating Parameters*</b>		
Temperature (F)	122.0	
Pressure (psig)	7.0	
<b>Total Produced Gas VOC Emissions*</b>		
VOC Losses (ton/yr)	10.40	

Notes

\* From ProMax AP-42 Emissions Report

**Speciated Produced Gas Emissions -HT-1 & HT-2**

Component	Heater Treater Produced Gas (each)	
	Produced Gas (lb/hr)	Produced Gas (tpy)
Nitrogen	42.98	188.25
CO2	11.17	48.92
Methane	8.83	38.68
Ethane	0.46	2.01
Propane	0.17	0.76
Isobutane	0.02	0.09
n-Butane	0.04	0.16
Isopentane	0.03	0.15
n-Pentane	0.01	0.07
i-C6	0.27	1.17
n-Hexane	0.41	1.81
Benzene	1.67E-04	7.32E-04
Cyclohexane	3.68E-03	0.02
i-C7	0.12	0.51
n-Heptane	--	--
Toluene	2.14E-04	9.37E-04
2,2,4-Trimethylpentane	5.32E-04	2.33E-03
n-Octane	0.07	0.31
Ethylbenzene	1.35E-03	0.01
m-Xylene	3.95E-03	0.02
3-Methyloctane	--	--
n-Nonane	0.03	0.14
H2S	2.30	10.07
Water	0.46	2.03
C10+	2.49E-04	1.09E-03
<b>Total</b>	<b>67.39</b>	<b>295.16</b>
<b>Total CO2</b>	<b>11.17</b>	<b>48.92</b>
<b>Total Methane</b>	<b>8.83</b>	<b>38.68</b>
<b>Total CO<sub>2</sub>e</b>	<b>231.94</b>	<b>1,015.88</b>
<b>Total VOC</b>	<b>1.19</b>	<b>5.20</b>
<b>Total HAP</b>	<b>0.42</b>	<b>1.84</b>

Marathon Oil, LLC  
Maverick Springs  
Crude Oil Run Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source		Run Tank 8083
Throughput (BPD)		1,800.00
Throughput (BPY)		657,000
Tank Dimensions		
Shell Height (ft)		15.0
Diameter (ft)		12.0
Volume (gal)		12,690
Turnovers <sup>a</sup>		2,415.75
Net Throughput (gal/yr)		27,594,000
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>		Tan
Shell & Roof Condition		Good
Meteorological Data		Cheyenne, WY
Tank Contents		
Crude RVP <sup>c</sup>		1.13
Water		0.04%
Total Uncontrolled Tank VOC Emissions		
VOC Flashing Losses (ton/yr) <sup>c</sup>		0.12
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>		0.38
Total VOC Losses (ton/yr) <sup>c</sup>		0.50

Notes  
<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report

Component	Crude Oil Sales Tank- 300 BBL			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	0.06	1.17	0.27	1.97
CO2	0.59	1.42	2.57	1.22
Methane	0.12	0.66	0.51	0.75
Ethane	0.04	0.08	0.20	0.06
Propane	0.02	0.04	0.07	0.02
Isobutane	1.75E-03	4.93E-03	0.01	2.48E-03
n-Butane	3.03E-03	0.01	0.01	4.26E-03
Isopentane	2.74E-03	0.01	0.01	3.66E-03
n-Pentane	1.21E-03	4.01E-03	0.01	1.61E-03
i-C6	0.02	0.07	0.09	0.03
n-Hexane	0.03	0.12	0.14	0.04
Benzene	1.05E-05	4.83E-05	4.58E-05	1.64E-05
Cyclohexane	2.99E-04	1.07E-03	1.31E-03	3.55E-04
i-C7	2.43E-03	0.03	0.01	0.01
n-Heptane	--	--	--	--
Toluene	1.38E-05	6.59E-05	6.04E-05	1.89E-05
2,2,4-Trimethylpentane	3.84E-05	1.60E-04	1.68E-04	4.80E-05
n-Octane	4.59E-03	0.02	0.02	0.01
Ethylbenzene	8.92E-05	4.39E-04	3.91E-04	1.08E-04
m-Xylene	3.46E-04	1.28E-03	1.51E-03	3.13E-04
3-Methyloctane	--	--	--	--
n-Nonane	1.80E-03	0.01	0.01	2.23E-03
H2S	0.24	0.46	1.05	0.29
Water	1.89E-05	0.08	8.28E-05	0.05
C10+	5.76E-06	4.12E-05	2.52E-05	8.44E-06
<b>Total</b>	<b>1.14</b>	<b>4.19</b>	<b>4.97</b>	<b>4.45</b>
<b>Total CO2</b>	<b>0.59</b>	<b>1.42</b>	<b>2.57</b>	<b>1.22</b>
<b>Total Methane</b>	<b>0.12</b>	<b>0.66</b>	<b>0.51</b>	<b>0.75</b>
<b>Total CO<sub>2</sub>e</b>	<b>3.48</b>	<b>17.84</b>	<b>15.26</b>	<b>19.94</b>
<b>Total VOC</b>	<b>0.09</b>	<b>0.33</b>	<b>0.38</b>	<b>0.12</b>
<b>Total HAP</b>	<b>0.03</b>	<b>0.12</b>	<b>0.14</b>	<b>0.04</b>

Marathon Oil , LLC  
Maverick Springs  
Crude Oil Overflow Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source		Overflow Tank 8081
Throughput (BPD)		2.00
Throughput (BPY)		730
Tank Dimensions		
Shell Height (ft)		15.0
Diameter (ft)		12.0
Volume (gal)		12,690
Turnovers <sup>a</sup>		2.68
Net Throughput (gal/yr)		30,660
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>		Tan
Shell & Roof Condition		Good
Meteorological Data		Cheyenne, WY
Tank Contents		
Crude RVP <sup>c</sup>		1.13
Water		0.04%
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>		0.11

Notes

- <sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height
- <sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.
- <sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Crude Oil Overflow Tank Emissions

Component	Crude Oil Overflow Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	1.13E-03	4.96E-03
CO2	0.01	0.03
Methane	1.59E-03	0.01
Ethane	8.53E-04	3.74E-03
Propane	1.35E-03	0.01
Isobutane	4.34E-04	1.90E-03
n-Butane	1.05E-03	4.60E-03
Isopentane	9.48E-04	4.15E-03
n-Pentane	4.18E-04	1.83E-03
i-C6	0.01	0.03
n-Hexane	0.01	0.05
Benzene	3.63E-06	1.59E-05
Cyclohexane	1.04E-04	4.54E-04
i-C7	8.42E-04	3.69E-03
n-Heptane	-	-
Toluene	4.78E-06	2.09E-05
2,2,4-Trimethylpentane	1.33E-05	5.83E-05
n-Octane	1.59E-03	0.01
Ethylbenzene	3.09E-05	1.35E-04
m-Xylene	1.20E-04	5.25E-04
3-Methyloctane	-	-
n-Nonane	6.24E-04	2.73E-03
H2S	0.01	0.04
Water	6.55E-06	2.87E-05
C10+	2.00E-06	8.75E-06
<b>Total</b>	<b>0.05</b>	<b>0.21</b>
<b>Total CO2</b>	<b>0.01</b>	<b>0.03</b>
<b>Total Methane</b>	<b>1.59E-03</b>	<b>0.01</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.05</b>	<b>0.21</b>
<b>Total VOC</b>	<b>0.03</b>	<b>0.11</b>
<b>Total HAP</b>	<b>0.01</b>	<b>0.05</b>

Marathon Oil, LLC  
Maverick Springs  
Crude Reject Oil Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source		Reject Tank 8080
Throughput (BPD)		10.00
Throughput (BPY)		3,650
Tank Dimensions		
Shell Height (ft)		15.0
Diameter (ft)		12.0
Volume (gal)		12,690
Turnovers <sup>a</sup>		13.42
Net Throughput (gal/yr)		153,300
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>		Tan
Shell & Roof Condition		Good
Meteorological Data		Cheyenne, WY
Tank Contents		
Crude RVP <sup>c</sup>		1.13
Water		0.04%
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>d</sup>		0.03

Notes

- <sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.
- <sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.
- <sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Crude Oil Reject Tank Emissions

Component	Crude Oil Reject Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	4.12E-03	0.02
CO2	0.04	0.16
Methane	0.01	0.03
Ethane	3.04E-03	0.01
Propane	1.03E-03	4.53E-03
Isobutane	1.18E-04	5.17E-04
n-Butane	2.04E-04	8.95E-04
Isopentane	1.85E-04	8.09E-04
n-Pentane	8.14E-05	3.57E-04
i-C6	1.40E-03	0.01
n-Hexane	2.20E-03	0.01
Benzene	7.06E-07	3.09E-06
Cyclohexane	2.02E-05	8.84E-05
i-C7	1.64E-04	7.18E-04
n-Heptane	--	--
Toluene	9.31E-07	4.08E-06
2,2,4-Trimethylpentane	2.59E-06	1.14E-05
n-Octane	3.10E-04	1.36E-03
Ethylbenzene	6.02E-06	2.64E-05
m-Xylene	2.33E-05	1.02E-04
3-Methyloctane	--	--
n-Nonane	1.21E-04	5.32E-04
H2S	0.02	0.07
Water	1.28E-06	5.59E-06
C10+	3.89E-07	1.70E-06
<b>Total</b>	<b>0.07</b>	<b>0.32</b>
<b>Total CO2</b>	<b>0.04</b>	<b>0.16</b>
<b>Total Methane</b>	<b>0.01</b>	<b>0.03</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.23</b>	<b>1.02</b>
<b>Total VOC</b>	<b>0.01</b>	<b>0.03</b>
<b>Total HAP</b>	<b>2.23E-03</b>	<b>0.01</b>

Marathon Oil , LLC  
Maverick Springs  
Slop Oil Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source	Heated Slop Oil Tank 8082	
Throughput (BPD)	10.00	
Throughput (BPY)	3,650	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	13.42	
Net Throughput (gal/yr)	153,300	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	1.13	
Water	0.04%	
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	0.03	

Notes

- <sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Slop Oil Tank Emissions

Component	Slop Oil Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	4.12E-03	0.02
CO2	0.04	0.16
Methane	0.01	0.03
Ethane	3.04E-03	0.01
Propane	1.03E-03	4.53E-03
Isobutane	1.18E-04	5.17E-04
n-Butane	2.04E-04	8.95E-04
Isopentane	1.85E-04	8.09E-04
n-Pentane	8.14E-05	3.57E-04
i-C6	1.40E-03	0.01
n-Hexane	2.20E-03	0.01
Benzene	7.06E-07	3.09E-06
Cyclohexane	2.02E-05	8.84E-05
i-C7	1.64E-04	7.18E-04
n-Heptane	--	--
Toluene	9.31E-07	4.08E-06
2,2,4-Trimethylpentane	2.59E-06	1.14E-05
n-Octane	3.10E-04	1.36E-03
Ethylbenzene	6.02E-06	2.64E-05
m-Xylene	2.33E-05	1.02E-04
3-Methyloctane	--	--
n-Nonane	1.21E-04	5.32E-04
H2S	0.02	0.07
Water	1.28E-06	5.59E-06
C10+	3.89E-07	1.70E-06
<b>Total</b>	<b>0.07</b>	<b>0.32</b>
<b>Total CO2</b>	<b>0.04</b>	<b>0.16</b>
<b>Total Methane</b>	<b>0.01</b>	<b>0.03</b>
<b>Total CO<sub>2e</sub></b>	<b>0.23</b>	<b>1.02</b>
<b>Total VOC</b>	<b>0.01</b>	<b>0.03</b>
<b>Total HAP</b>	<b>2.23E-03</b>	<b>0.01</b>

Marathon Oil, LLC  
Maverick Springs  
Produced Water Tanks

Identification - Vertical Fixed Roof Tanks		
Emission Source	WTK-1 - WTK-3	
Throughput (BPD)	25,921.00	
Throughput (BPY)	9,461,165	
Tank Dimensions		
Shell Height (ft)	16.0	
Diameter (ft)	21.0	
Volume (gal)	41,500	
Turnovers <sup>a</sup>	10,649.42	
Net Throughput (gal/yr)	397,368,930	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	1.13	
Water	99.98%	
Total Uncontrolled Tank VOC Emissions		
VOC Flashing Losses (ton/yr) <sup>c</sup>	1.90	
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	3.55E-04	
Total VOC Losses (ton/yr) <sup>c</sup>	1.90	

Notes  
<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.  
<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.  
<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Produced Water Tank Emissions -WTK-1, WTK-2, WTK-3

Component	Produced Water Tanks (per Tank) - 1,000 BBL			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	0.01	9.76	0.03	36.83
CO2	0.54	12.32	2.37	27.46
Methane	0.01	3.35	0.03	11.49
Ethane	5.51E-04	0.22	2.41E-03	0.66
Propane	2.48E-05	0.06	1.09E-04	0.20
Isobutane	5.99E-07	0.01	2.62E-06	0.02
n-Butane	1.01E-06	0.01	4.45E-06	0.04
Isopentane	1.88E-07	0.01	8.22E-07	0.03
n-Pentane	7.27E-09	1.62E-03	3.18E-08	0.01
i-C6	1.14E-07	0.04	4.98E-07	0.14
n-Hexane	2.28E-08	0.03	9.99E-08	0.12
Benzene	7.50E-08	1.67E-04	3.29E-07	3.03E-04
Cyclohexane	3.30E-08	2.26E-03	1.45E-07	0.01
i-C7	2.08E-09	0.01	9.10E-09	0.05
n-Heptane	--	--	--	--
Toluene	1.91E-08	2.00E-04	8.36E-08	3.67E-04
2,2,4-Trimethylpentane	2.60E-11	5.13E-05	1.14E-10	1.87E-04
n-Octane	1.37E-11	1.56E-03	5.98E-11	0.01
Ethylbenzene	3.40E-08	1.20E-03	1.49E-07	2.08E-03
m-Xylene	7.36E-08	3.40E-03	3.22E-07	0.01
3-Methyloctane	--	--	--	--
n-Nonane	2.68E-12	7.17E-04	1.17E-11	3.01E-03
H2S	0.10	2.59	0.46	5.51
Water	0.59	0.60	2.59	0.90
C10+	2.33E-12	2.39E-05	1.02E-11	7.13E-05
<b>Total</b>	<b>1.25</b>	<b>29.02</b>	<b>5.49</b>	<b>83.49</b>
<b>Total CO2</b>	<b>0.54</b>	<b>12.32</b>	<b>2.37</b>	<b>27.46</b>
<b>Total Methane</b>	<b>0.01</b>	<b>3.35</b>	<b>0.03</b>	<b>11.49</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.73</b>	<b>96.15</b>	<b>3.18</b>	<b>314.72</b>
<b>Total VOC</b>	<b>2.70E-05</b>	<b>0.18</b>	<b>1.18E-04</b>	<b>0.63</b>
<b>Total HAP</b>	<b>2.25E-07</b>	<b>0.04</b>	<b>9.84E-07</b>	<b>0.13</b>

Marathon Oil EF, LLC  
Maverick Springs  
Heater Treater Burner Emissions

Background Information	
Emission Source	B-1
Heater/Boiler rating (MMBtu/hr):	1
Rating above is:	below 100 MMBtu/hr, uncontrolled
Operating hours/year:	8760
Estimated Propane Usage (gal/hr):	10.9290
Fuel Heat Value (Btu/scf) <sup>a</sup> :	2516.10
Fuel Heat Value (Btu/gal) <sup>a</sup> :	91500
Fuel Rate (gal/yr):	95,738

<sup>a</sup> Heating value from AP-42 Table 1.5-1 for Propane (07/2008)

Pollutant	Emission Factor <sup>a</sup> (lb/10 <sup>3</sup> gal)	lb/hr	tpy
VOC	1.1	1.20E-05	5.27E-05
NOx	15	1.64E-04	7.18E-04
CO	8.4	9.18E-05	4.02E-04
PM <sub>10</sub>	0.8	8.74E-06	3.83E-05
PM <sub>2.5</sub>	0.8	8.74E-06	3.83E-05
SO <sub>2</sub>	0.09	9.84E-07	4.31E-06
<b>HAPS</b>			
Arsenic	0.0002	2.19E-09	9.57E-09
Benzene	0.0021	2.30E-08	1.01E-07
Beryllium	0.000012	1.31E-10	5.74E-10
Cadmium	0.0011	1.20E-08	5.27E-08
Chromium	0.0014	1.53E-08	6.70E-08
Cobalt	0.000084	9.18E-10	4.02E-09
Dichlorobenzene	0.0012	1.31E-08	5.74E-08
Formaldehyde	0.075	8.20E-07	3.59E-06
n-Hexane	1.8	1.97E-05	8.62E-05
Lead	0.0005	5.46E-09	2.39E-08
Manganese	0.00038	4.15E-09	1.82E-08
Mercury	0.00026	2.84E-09	1.24E-08
Naphthalene	0.00061	6.67E-09	2.92E-08
Nickel	0.0021	2.30E-08	1.01E-07
POM	0.000088	9.62E-10	4.21E-09
Toluene	0.0034	3.72E-08	1.63E-07
Selenium	0.000024	2.62E-10	1.15E-09
<b>Total HAPs</b>		<b>2.06E-05</b>	<b>9.04E-05</b>
<b>Other Pollutants</b>			
H <sub>2</sub> S	N/A <sup>c</sup>	--	--

<sup>a</sup> Emission factors are taken from AP-42, Chapter 1, Tables 1.5-1 dated July 2008.

<sup>b</sup> SO<sub>2</sub> emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>c</sup> H<sub>2</sub>S emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>d</sup> Greenhouse Gas Factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

<sup>e</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

H <sub>2</sub> S Max Concentration (ppmv)	H <sub>2</sub> S Mass to Heater Treater	H <sub>2</sub> S Mass to Heater Treater (tpy)
0	0.00E+00	0.00E+00

<sup>a</sup> H<sub>2</sub>S Mass to Heater Treater (lb/hr) = H<sub>2</sub>S Max Concentration (ppmv) / 10<sup>5</sup> \* Fuel Rate (scf/hr) / Standard Molar Volume (scf/lbmol) \* H<sub>2</sub>S MW (lb/lbmol)

Example Calculation (VOC):

EMISSION FACTOR	FEED RATE PER HOUR	HOURLY EMISSIONS	ANNUAL OPERATING HOURS	WEIGHT CONVERSION	ANNUAL EMISSIONS
1.1 lb VOC / MMscf Natural Gas Burned	10.9290 MMscf / hr	0.00 lb VOC / hr	8,760 hours / yr	1 ton / 2,000 lbs	0.00 tons VOC / yr

Criteria Pollutant Emission Factors obtained from AP-42 Nat Gas Combustion, Table 1.4-1, (7/98) < 100 MMBtu/hr heat input; & Table

Parameter	Value
scf/lbmole	379.3
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H <sub>2</sub> S molecular weight	34.08
SO <sub>2</sub> molecular weight	64.06

GHG Pollutant Emissions <sup>d,e</sup>	
GHG CO <sub>2</sub> Factor:	120,000 lb/MMscf
GHG CH <sub>4</sub> Factor:	2.3 lb/MMscf
GHG N <sub>2</sub> O Factor:	2.2 lb/MMscf
GWP CO <sub>2</sub> Equivalent:	1
GWP CH <sub>4</sub> Equivalent:	25
GWP N <sub>2</sub> O Equivalent:	298
CO <sub>2</sub> emissions:	208.89 tpy
CH <sub>4</sub> emissions:	4.00E-03 tpy
N <sub>2</sub> O emissions:	3.83E-03 tpy
CO <sub>2</sub> e emissions:	210.14 tpy

Marathon Oil EF, LLC  
Maverick Springs  
Heater Treater Burner Emissions

Background Information	
Emission Source	B-2
Heater/Boiler rating (MMBtu/hr):	1
Rating above is:	below 100 MMBtu/hr, uncontrolled
Operating hours/year:	8760
Estimated Propane Usage (gal/hr):	10.9290
Fuel Heat Value (Btu/scf) <sup>a</sup> :	2516.10
Fuel Heat Value (Btu/gal) <sup>a</sup> :	91500
Fuel Rate (gal/yr):	95,738

<sup>a</sup> Heating value from AP-42 Table 1.5-1 for Propane (07/2008)

Pollutant	Emission Factor <sup>a</sup> (lb/10 <sup>3</sup> gal)	lb/hr	tpy
VOC	1.1	1.20E-05	5.27E-05
NOx	15	1.64E-04	7.18E-04
CO	8.4	9.18E-05	4.02E-04
PM <sub>1.0</sub>	0.8	8.74E-06	3.83E-05
PM <sub>2.5</sub>	0.8	8.74E-06	3.83E-05
SO <sub>2</sub>	0.09	9.84E-07	4.31E-06
<b>HAPS</b>			
Arsenic	0.0002	2.19E-09	9.57E-09
Benzene	0.0021	2.30E-08	1.01E-07
Beryllium	0.000012	1.31E-10	5.74E-10
Cadmium	0.0011	1.20E-08	5.27E-08
Chromium	0.0014	1.53E-08	6.70E-08
Cobalt	0.000084	9.18E-10	4.02E-09
Dichlorobenzene	0.0012	1.31E-08	5.74E-08
Formaldehyde	0.075	8.20E-07	3.59E-06
n-Hexane	1.8	1.97E-05	8.62E-05
Lead	0.0005	5.46E-09	2.39E-08
Manganese	0.00038	4.15E-09	1.82E-08
Mercury	0.00026	2.84E-09	1.24E-08
Naphthalene	0.00061	6.67E-09	2.92E-08
Nickel	0.0021	2.30E-08	1.01E-07
POM	0.000088	9.62E-10	4.21E-09
Toluene	0.0034	3.72E-08	1.63E-07
Selenium	0.000024	2.62E-10	1.15E-09
<b>Total HAPs</b>		<b>2.06E-05</b>	<b>9.04E-05</b>
<b>Other Pollutants</b>			
H <sub>2</sub> S	N/A <sup>c</sup>	--	--

<sup>a</sup> Emission factors are taken from AP-42, Chapter 1, Tables 1.5-1 dated July 2008.

<sup>b</sup> SO<sub>2</sub> emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>c</sup> H<sub>2</sub>S emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>d</sup> Greenhouse Gas Factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

<sup>e</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

Parameter	Value
scf/lbmole	379.3
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H <sub>2</sub> S molecular weight	34.08
SO <sub>2</sub> molecular weight	64.06

GHG Pollutant Emissions <sup>d,e</sup>	
GHG CO <sub>2</sub> Factor:	120,000 lb/MMscf
GHG CH <sub>4</sub> Factor:	2.3 lb/MMscf
GHG N <sub>2</sub> O Factor:	2.2 lb/MMscf
GWP CO <sub>2</sub> Equivalent:	1
GWP CH <sub>4</sub> Equivalent:	25
GWP N <sub>2</sub> O Equivalent:	298
CO <sub>2</sub> emissions:	208.89 tpy
CH <sub>4</sub> emissions:	4.00E-03 tpy
N <sub>2</sub> O emissions:	3.83E-03 tpy
CO <sub>2</sub> e emissions:	210.14 tpy

H <sub>2</sub> S Max Concentration (ppmv)	H <sub>2</sub> S Mass to Heater Treater	H <sub>2</sub> S Mass to Heater Treater (tpy)
0	0.00E+00	0.00E+00

<sup>a</sup> H<sub>2</sub>S Mass to Heater Treater (lb/hr) = H<sub>2</sub>S Max Concentration (ppmv) / 10<sup>6</sup> \* Fuel Rate (scf/hr) / Standard Molar Volume (scf/lbmol) \* H<sub>2</sub>S MW (lb/lbmol)

Example Calculation (VOC):

EMISSION FACTOR	FEED RATE PER HOUR	HOURLY EMISSIONS	ANNUAL OPERATING HOURS	WEIGHT CONVERSION	ANNUAL EMISSIONS
1.1 lb VOC MMscf Natural Gas Burned	x 10.9290 MMscf hr	= 0.00 lb VOC hr	x 8,760 hours yr	x 1 ton 2,000 lbs	= 0.00 tons VOC. yr

Criteria Pollutant Emission Factors obtained from AP-42 Nat Gas Combustion, Table 1.4-1, (7/98) < 100 MMBtu/hr heat input; & Table

Planned MSS - Degassing Due to Passive Expansion / Thermal Expansion / Non-Forced Ventilation

	Run Tank 8083	Overflow Tank 8081	Reject Tank 8080	Heated Slop Oil Tank 8082
MSS Controls?	none	none	none	none
Control Efficiency (%)	0.0%	0.0%	0.0%	0.0%
Event duration, hours/event	1.00	1.00	1.00	1.00
Events per year	1.00	1.00	1.00	1.00
Tank Diameter, ft	12.00	12.00	12.00	21.00
Tank Height, ft	15.00	15.00	15.00	16.00
<sup>a</sup> Vapor Space Volume, ft <sup>3</sup>	848.2	848.2	848.2	2,770.9
<sup>b</sup> Venting Gas MW (lb/lb-mol)	34.98	49.57	34.73	25.58
<sup>b</sup> VOC wt %	0.08%	0.56%	0.08%	0.00%
<sup>b</sup> Benzene wt%	0.00%	0.00%	0.00%	0.00%
<sup>b</sup> H <sub>2</sub> S wt%	0.21%	0.21%	0.22%	0.08%
<sup>b</sup> HAPs wt%	0.03%	0.24%	0.03%	0.00%
<sup>b</sup> CO <sub>2</sub> wt%	0.52%	0.16%	0.50%	0.43%
<sup>b</sup> CH <sub>4</sub> wt%	0.10%	0.03%	0.11%	0.01%
Tank Temperature, °F	66.84	66.84	66.84	66.84
True Vapor Pressure, psia	5.23	5.23	5.23	5.23
Emissions, lb/event	27.42	38.86	27.22	65.51
Hourly Total Emissions, lb/hr	27.42	38.86	27.22	65.51
Annual Total Emissions, TPY	0.01	0.02	0.01	0.03
Total CO <sub>2</sub> , TPY	7.08E-05	3.07E-05	6.80E-05	1.41E-04
Total Methane, TPY	1.40E-05	6.60E-06	1.44E-05	1.94E-06
Total CO <sub>2</sub> e, TPY	4.21E-04	1.96E-04	4.28E-04	1.90E-04
Total VOC, TPY	1.05E-05	1.08E-04	1.08E-05	7.07E-09
Total HAP, TPY	4.00E-06	4.76E-05	4.11E-06	5.87E-11
Total H <sub>2</sub> S, TPY	2.90E-05	4.08E-05	2.98E-05	2.73E-05
Total Benzene, TPY	1.26E-09	1.51E-08	1.30E-09	1.96E-11

Total Emissions	lb/hr	TPY
Total	159.00	0.08
Total CO <sub>2</sub>	0.62	0.00
Total Methane	0.07	0.00
Total CO <sub>2</sub> e	2.47	0.00
Total VOC	0.26	0.00
Total HAP	0.11	0.00
Total H <sub>2</sub> S	0.25	0.00
Total Benzene	0.00	0.00

Ideal Gas Constant, [(ft<sup>3</sup>\*psia)/(R\*lb-mol)]  
10.73159

<sup>a</sup> Assuming 50% of tank is filled  
<sup>b</sup> From ProMax Tank Loss Stream

# APPENDIX B

Emissions Calculations- Actual Emissions



**Marathon Oil Company  
Maverick Springs  
Facility Information**

<b><u>Oil and Gas Site General Information</u></b>	
<b><u>Administrative Information</u></b>	
Company Name	Marathon Oil Company
Facility/Well Name	Maverick Springs
Nearest City/Town	Riverton
County	Fremont

<b><u>Technical Information</u></b>	
Produced Gas Site Throughput (MMSCF/day):	0.04
Produced Gas Site Throughput (MMSCF/year):	15.16
Oil/Condensate Site Throughput (bbl/day):	533
Oil/Condensate Site Throughput (bbl/year):	194,647
Produced Water Site Throughput (bbl/day):	50,681
Produced Water Site Throughput (bbl/year):	18,498,565
Are there any sour gas streams at this site?	Yes
Gas H2S Concentration (ppm)	35,600
Has this site been registered before?	Yes

<b><u>Equipment/Process Types</u></b>	<b><u>How many for this project?</u></b>
Fugitives	NO
IC Engines	0
Turbines	0
Compressors (electric)	0
Diesel Engines	0
Heaters-Boilers	2
Separators	5
Oil / Condensate Tanks	4
Produced Water Tanks	4
Miscellaneous Tanks	3
Loading Jobs	0
Glycol Units	0
Amine Units	0
Vapor Recovery Units	0
Flares-Vapor Combustors	0
Thermal Oxidizers	0
MSS	YES



**Marathon Oil Company  
Maverick Springs  
Fugitive Emissions**

**Background Information**

Total fugitive component counts are based on equipment counts at the facility and default average component counts for major crude oil production equipment (40 CFR Part 98, Subpart W, Table W-1C) and major onshore natural gas production equipment (40 CFR Part 98, Subpart W, Table W-1B). Since both light oil and gas components are present at the facility, the emissions assume the maximum component emission factor.

**Component Count for Oil Production**

Major equipment	Valves	Flanges	Connectors	Open-ended lines	Other components
Wellhead	5	10	4	0	1
Separator	6	12	10	0	0
Meters/piping	0	0	0	0	0
Heater-treater	8	12	20	0	0
Header	5	10	4	0	0
In-line heaters	0	0	0	0	0
Dehydrators	0	0	0	0	0
Compressors	0	0	0	0	0

**Component Count for Gas Production (Western US)**

Major equipment	Valves	Flanges	Connectors	Open-ended lines	Other components
Wellhead	11	0	36	1	0
Separators	34	0	106	6	2
Meters/piping	14	0	51	1	1
Heater-treater	0	0	0	0	0
Header	0	0	0	0	0
In-line heaters	14	0	65	2	1
Dehydrators	24	0	90	2	2
Compressors	73	0	179	3	4

**Facility Equipment Counts**

Major equipment	Gas Production	Oil Production
Wellhead	0	0
Separator	3	2
Meters/piping	0	2
Heater-treater	N/A	2
Header	0	1
In-line heaters	0	N/A
Dehydrators	0	N/A
Compressors	0	N/A

Component Service	Component Counts - MRR Approach				
	Valve	Flanges	Connectors	Open-Ended Line	Other Components
Gas Service	102	0	318	18	6
Light Oil Service	35	58	64	0	0

**Emissions Estimate**

Liquid Equipment/Service	Oil and Gas Production Operations Emission Factor <sup>a</sup> (Light Oil)	Oil and Gas Production Operations Emission Factor <sup>a</sup> (Gas)	# Light Oil Components	# Gas Components	Short-Term TOC Emissions <sup>b</sup>	Annual TOC Emissions <sup>c</sup>
	(lb TOC/hr/component)	(lb TOC/hr/component)			(lb/hr)	(ton/yr)
Valves	0.0055	0.00992	33	102	1.19	5.23
Flanges	0.000243	0.00086	58	0	0.01	0.06
Open-Ended Lines	0.00309	0.00441	0	18	0.08	0.35
Connectors	0.000463	0.00044	64	318	0.17	0.74
Other	0.0165	0.0194	0	6	0.12	0.51
<b>Total</b>					<b>1.57</b>	<b>6.89</b>

<sup>a</sup> Emission factors are for oil and gas production facilities (not refineries) come from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4.

<sup>b</sup> Controlled Short-Term ER (lb/hr) = (100% - Reduction Factor) \* Σ(Number of Components \* Emissions Factor [lb/hr/component])

<sup>c</sup> Controlled Annual ER (tpy) = Controlled Short-Term ER (lb/hr) \* 8,760 (hr/yr) / 2,000 (lb/ton)

<sup>d</sup> No reduction from LDAR monitoring is being claimed.

Marathon Oil Company  
Maverick Springs  
Fugitive Emissions

Speciated Fugitive Emissions<sup>a</sup>

Component	Light Oil (lb/hr)	Light Oil (ton/year)	Gas (lb/hr)	Gas (ton/year)	Total (lb/hr)	Total (ton/year)
Nitrogen	0.11	0.50	6.47	28.34	6.58	28.84
CO <sub>2</sub>	1.46	6.40	5.58	24.42	7.04	30.82
Methane	0.24	1.04	2.55	11.16	2.79	12.20
Ethane	0.12	0.53	0.30	1.31	0.42	1.84
Propane	0.06	0.25	0.20	0.87	0.26	1.12
Isobutane	0.01	0.04	0.03	0.15	0.04	0.18
n-Butane	0.01	0.06	0.06	0.28	0.08	0.35
Isopentane	0.01	0.03	0.04	0.16	0.04	0.19
n-Pentane	3.80E-03	0.02	0.02	0.09	0.02	0.11
n-C6	0.04	0.19	0.27	1.17	0.31	1.36
n-Hexane	0.07	0.30	0.43	1.90	0.50	2.20
Benzene	4.39E-05	1.92E-04	3.46E-04	1.52E-03	3.90E-04	1.71E-03
Cyclohexane	6.98E-04	3.06E-03	4.31E-03	0.02	0.01	0.02
n-C7	0.01	0.02	0.13	0.57	0.14	0.59
n-Heptane	--	--	--	--	--	--
Toluene	7.11E-05	3.12E-04	6.20E-04	2.72E-03	6.91E-04	3.03E-03
2,2,4-Trimethylpentane	8.01E-05	3.51E-04	5.97E-04	2.62E-03	6.77E-04	2.97E-03
n-Octane	0.01	0.05	0.11	0.47	0.12	0.52
Ethylbenzene	1.85E-04	8.08E-04	1.76E-03	0.01	1.95E-03	0.01
m-Xylene	7.26E-04	3.18E-03	0.01	0.02	0.01	0.03
3-Methyloctane	--	--	--	--	--	--
n-Nonane	3.76E-03	0.02	0.05	0.20	0.05	0.22
H <sub>2</sub> S	0.50	2.21	1.36	5.96	1.86	8.16
Water	3.92E-05	1.72E-04	0.23	1.00	0.23	1.00
C10+	1.21E-05	5.30E-05	1.95E-04	8.52E-04	2.07E-04	9.05E-04
<b>Total</b>	<b>2.66</b>	<b>11.66</b>	<b>17.83</b>	<b>78.10</b>	<b>20.49</b>	<b>89.76</b>
<b>TOC</b>	<b>0.58</b>	<b>2.56</b>	<b>4.20</b>	<b>18.38</b>	<b>4.78</b>	<b>20.94</b>
<b>VOC</b>	<b>0.23</b>	<b>0.99</b>	<b>1.35</b>	<b>5.90</b>	<b>1.57</b>	<b>6.89</b>
<b>Total HAP</b>	<b>0.07</b>	<b>0.31</b>	<b>0.44</b>	<b>1.93</b>	<b>0.51</b>	<b>2.24</b>

<sup>a</sup> Fugitive oil emissions speciation is based on the crude oil tank W&B vapors. Fugitive gas emissions speciation is based on sales gas stream.

Marathon Oil Company  
Maverick Springs  
Heater Treater Produced Gas

Identification		
Emission Source		HT-1- HT-2
Produced Gas Throughput (MMscfd)		0.0405
Produced Gas Throughput (MMscf/yr)		14.78
Heater Treater Operating Parameters <sup>a</sup>		
Temperature (F)		122.0
Pressure (psig)		7.0

Notes

<sup>a</sup> From ProMax AP-42 Emissions Report

Speciated Produced Gas Emissions -HT-1 & HT-2

Component	Heater Treater Produced Gas (each)	
	Produced Gas (lb/hr)	Produced Gas (tpy)
Nitrogen	37.64	164.85
CO2	11.79	51.65
Methane	8.01	35.09
Ethane	0.51	2.22
Propane	0.26	1.13
Isobutane	0.04	0.16
n-Butane	0.07	0.30
Isopentane	0.03	0.14
n-Pentane	0.02	0.08
i-C6	0.21	0.92
n-Hexane	0.32	1.40
Benzene	2.57E-04	1.12E-03
Cyclohexane	3.14E-03	0.01
i-C7	0.09	0.38
n-Heptane	--	--
Toluene	3.91E-04	1.71E-03
2,2,4-Trimethylpentane	3.97E-04	1.74E-03
n-Octane	0.06	0.26
Ethylbenzene	9.61E-04	4.21E-03
m-Xylene	2.84E-03	0.01
3-Methyloctane	--	--
n-Nonane	0.02	0.10
H2S	1.95	8.55
Water	0.40	1.74
C10+	8.46E-05	3.71E-04
<b>Total</b>	<b>61.41</b>	<b>269.00</b>
<b>Total CO2</b>	<b>11.79</b>	<b>51.65</b>
<b>Total Methane</b>	<b>8.01</b>	<b>35.09</b>
<b>Total CO<sub>2</sub>e</b>	<b>212.08</b>	<b>928.92</b>
<b>Total VOC</b>	<b>1.12</b>	<b>4.90</b>
<b>Total HAP</b>	<b>0.32</b>	<b>1.42</b>

Marathon Oil Company  
Maverick Springs  
Crude Oil Run Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source		Run Tank 8083
Throughput (BPD)		533.28
Throughput (BPY)		194,647
Tank Dimensions		
Shell Height (ft)		15.0
Diameter (ft)		12.0
Volume (gal)		12,690
Turnovers <sup>a</sup>		715.71
Net Throughput (gal/yr)		8,175,182
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>		Tan
Shell & Roof Condition		Good
Meteorological Data		Cheyenne, WY
Tank Contents		
Crude RVP <sup>c</sup>		1.13
Water		0.04%
Total Uncontrolled Tank VOC Emissions		
VOC Flashing Losses (ton/yr) <sup>c</sup>		0.04
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>		0.47
Total VOC Losses (ton/yr) <sup>c</sup>		0.51

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report.

Speciated Crude Oil Sales Tank Emissions

Component	Crude Oil Sales Tank- 300 BBL			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	0.05	0.33	0.24	0.52
CO2	0.69	0.53	3.04	0.41
Methane	0.11	0.20	0.50	0.21
Ethane	0.06	0.03	0.25	0.02
Propane	0.03	0.02	0.12	0.01
Isobutane	3.83E-03	3.44E-03	0.02	1.55E-03
n-Butane	0.01	0.01	0.03	2.79E-03
Isopentane	3.42E-03	3.47E-03	0.01	1.31E-03
n-Pentane	1.81E-03	1.92E-03	0.01	6.91E-04
i-C6	0.02	0.02	0.09	0.01
n-Hexane	0.03	0.04	0.14	0.01
Benzene	2.09E-05	3.08E-05	9.15E-05	9.35E-06
Cyclohexane	3.32E-04	3.80E-04	1.45E-03	1.13E-04
i-C7	2.43E-03	0.01	0.01	3.04E-03
n-Heptane	--	--	--	--
Toluene	3.39E-05	5.17E-05	1.48E-04	1.33E-05
2,2,4-Trimethylpentane	3.81E-05	5.06E-05	1.67E-04	1.36E-05
n-Octane	0.01	0.01	0.02	1.86E-03
Ethylbenzene	8.78E-05	1.38E-04	3.85E-04	3.03E-05
m-Xylene	3.45E-04	4.10E-04	1.51E-03	8.93E-05
3-Methyloctane	--	--	--	--
n-Nonane	1.79E-03	3.37E-03	0.01	6.35E-04
H2S	0.24	0.15	1.05	0.08
Water	1.86E-05	0.02	8.17E-05	0.01
C10+	5.76E-06	1.32E-05	2.52E-05	2.41E-06
<b>Total</b>	<b>1.27</b>	<b>1.38</b>	<b>5.55</b>	<b>1.30</b>
<b>Total CO2</b>	<b>0.69</b>	<b>0.53</b>	<b>3.04</b>	<b>0.41</b>
<b>Total Methane</b>	<b>0.11</b>	<b>0.20</b>	<b>0.50</b>	<b>0.21</b>
<b>Total CO<sub>2</sub>e</b>	<b>3.52</b>	<b>5.56</b>	<b>15.44</b>	<b>5.70</b>
<b>Total VOC</b>	<b>0.11</b>	<b>0.12</b>	<b>0.47</b>	<b>0.04</b>
<b>Total HAP</b>	<b>0.03</b>	<b>0.04</b>	<b>0.15</b>	<b>0.01</b>

Marathon Oil Company  
Maverick Springs  
Crude Oil Overflow Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source	Overflow Tank 8081	
Throughput (BPD)	2.00	
Throughput (BPY)	730	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	2.68	
Net Throughput (gal/yr)	30,660	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	1.13	
Water	0.04%	
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	0.14	

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Crude Oil Overflow Tank Emissions

Component	Crude Oil Overflow Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	1.02E-03	4.45E-03
CO2	0.01	0.04
Methane	1.56E-03	0.01
Ethane	1.09E-03	4.79E-03
Propane	2.37E-03	0.01
Isobutane	9.51E-04	4.17E-03
n-Butane	2.55E-03	0.01
Isopentane	1.26E-03	0.01
n-Pentane	6.68E-04	2.93E-03
i-C6	0.01	0.03
n-Hexane	0.01	0.05
Benzene	7.71E-06	3.38E-05
Cyclohexane	1.23E-04	5.37E-04
i-C7	8.99E-04	3.94E-03
n-Heptane	--	--
Toluene	1.25E-05	5.48E-05
2,2,4-Trimethylpentane	1.41E-05	6.17E-05
n-Octane	1.94E-03	0.01
Ethylbenzene	3.24E-05	1.42E-04
m-Xylene	1.28E-04	5.59E-04
3-Methyloctane	--	--
n-Nonane	6.62E-04	2.90E-03
H2S	0.01	0.04
Water	6.89E-06	3.02E-05
C10+	2.13E-06	9.31E-06
<b>Total</b>	<b>0.05</b>	<b>0.24</b>
<b>Total CO2</b>	<b>0.01</b>	<b>0.04</b>
<b>Total Methane</b>	<b>1.56E-03</b>	<b>0.01</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.05</b>	<b>0.21</b>
<b>Total VOC</b>	<b>0.03</b>	<b>0.14</b>
<b>Total HAP</b>	<b>0.01</b>	<b>0.05</b>

Marathon Oil Company  
Maverick Springs  
Crude Reject Oil Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source		Reject Tank 8080
Throughput (BPD)		10.00
Throughput (BPY)		3,650
Tank Dimensions		
Shell Height (ft)		15.0
Diameter (ft)		12.0
Volume (gal)		12,690
Turnovers <sup>a</sup>		13.42
Net Throughput (gal/yr)		153,300
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>		Tan
Shell & Roof Condition		Good
Meteorological Data		Cheyenne, WY
Tank Contents		
Crude RVP <sup>c</sup>		1.13
Water		0.04%
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>		0.03

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Crude Oil Reject Tank Emissions

Component	Crude Oil Reject Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	3.86E-03	0.02
CO2	0.04	0.19
Methane	0.01	0.03
Ethane	4.06E-03	0.02
Propane	1.91E-03	0.01
Isobutane	2.70E-04	1.18E-03
n-Butane	4.91E-04	2.15E-03
Isopentane	2.42E-04	1.06E-03
n-Pentane	1.28E-04	5.60E-04
i-C6	1.49E-03	0.01
n-Hexane	2.32E-03	0.01
Benzene	1.48E-06	6.46E-06
Cyclohexane	2.35E-05	1.03E-04
i-C7	1.72E-04	7.53E-04
n-Heptane	--	--
Toluene	2.39E-06	1.05E-05
2,2,4-Trimethylpentane	2.69E-06	1.18E-05
n-Octane	3.71E-04	1.62E-03
Ethylbenzene	6.21E-06	2.72E-05
m-Xylene	2.44E-05	1.07E-04
3-Methyloctane	--	--
n-Nonane	1.27E-04	5.54E-04
H2S	0.02	0.07
Water	1.32E-06	5.77E-06
C10+	4.07E-07	1.78E-06
<b>Total</b>	<b>0.08</b>	<b>0.37</b>
<b>Total CO2</b>	<b>0.04</b>	<b>0.19</b>
<b>Total Methane</b>	<b>0.01</b>	<b>0.03</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.24</b>	<b>1.04</b>
<b>Total VOC</b>	<b>0.01</b>	<b>0.03</b>
<b>Total HAP</b>	<b>2.35E-03</b>	<b>0.01</b>

Marathon Oil Company  
Maverick Springs  
Slop Oil Tank

Identification - Vertical Fixed Roof Tanks		
Emission Source	Heated Slop Oil Tank 8082	
Throughput (BPD)	10.00	
Throughput (BPY)	3,650	
Tank Dimensions		
Shell Height (ft)	15.0	
Diameter (ft)	12.0	
Volume (gal)	12,690	
Turnovers <sup>a</sup>	13.42	
Net Throughput (gal/yr)	153,300	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	1.13	
Water	0.04%	
Total Uncontrolled Tank VOC Emissions		
VOC Working & Breathing Losses (ton/yr) <sup>c</sup>	0.03	

Notes

<sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.

<sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.

<sup>c</sup> From ProMax AP-42 Emissions Report

Speciated Slop Oil Tank Emissions

Component	Slop Oil Tank- 300 BBL	
	Working & Breathing (lb/hr)	Working & Breathing (tpy)
Nitrogen	3.86E-03	0.02
CO2	0.04	0.19
Methane	0.01	0.03
Ethane	4.06E-03	0.02
Propane	1.91E-03	0.01
Isobutane	2.70E-04	1.18E-03
n-Butane	4.91E-04	2.15E-03
Isopentane	2.42E-04	1.06E-03
n-Pentane	1.28E-04	5.60E-04
i-C6	1.49E-03	0.01
n-Hexane	2.32E-03	0.01
Benzene	1.48E-06	6.46E-06
Cyclohexane	2.35E-05	1.03E-04
i-C7	1.72E-04	7.53E-04
n-Heptane	--	--
Toluene	2.39E-06	1.05E-05
2,2,4-Trimethylpentane	2.69E-06	1.18E-05
n-Octane	3.71E-04	1.62E-03
Ethylbenzene	6.21E-06	2.72E-05
m-Xylene	2.44E-05	1.07E-04
3-Methyloctane	--	--
n-Nonane	1.27E-04	5.54E-04
H2S	0.02	0.07
Water	1.32E-06	5.77E-06
C10+	2.13E-06	9.31E-06
<b>Total</b>	<b>0.08</b>	<b>0.37</b>
<b>Total CO2</b>	<b>0.04</b>	<b>0.19</b>
<b>Total Methane</b>	<b>0.01</b>	<b>0.03</b>
<b>Total CO<sub>2</sub>e</b>	<b>0.24</b>	<b>1.04</b>
<b>Total VOC</b>	<b>0.01</b>	<b>0.03</b>
<b>Total HAP</b>	<b>2.35E-03</b>	<b>0.01</b>

Marathon Oil Company  
Maverick Springs  
Produced Water Tanks

Identification - Vertical Fixed Roof Tanks		
Emission Source	WTK-1 - WTK-3	
Throughput (BPD)	16,893.67	
Throughput (BPY)	6,166,188	
Tank Dimensions		
Shell Height (ft)	16.0	
Diameter (ft)	21.0	
Volume (gal)	41,500	
Turnovers <sup>a</sup>	6,940.62	
Net Throughput (gal/yr)	258,979,910	
Other Inputs		
Shell & Roof Color/Shade <sup>b</sup>	Tan	
Shell & Roof Condition	Good	
Meteorological Data	Cheyenne, WY	
Tank Contents		
Crude RVP <sup>c</sup>	1.13	
Water	99.97%	
Total Uncontrolled Tank VOC Emissions		
VOC Flashing Losses (ton/yr) <sup>d</sup>	1.76	
VOC Working & Breathing Losses (ton/yr) <sup>e</sup>	3.93E-04	
Total VOC Losses (ton/yr) <sup>e</sup>	1.76	

- Notes
- <sup>a</sup> Turnovers calculated using equation 1-30 of AP-42, Chapter 7, assuming a maximum fill height of 90% of the tank shell height.
  - <sup>b</sup> Tan paint color selected in ProMax options to simulate Tan paint.
  - <sup>c</sup> From ProMax AP-42 Emissions Report

Component	Produced Water Tanks (per Tank) - 1,000 BBL			
	Working & Breathing (lb/hr)	Flashing (lb/hr)	Working & Breathing (tpy)	Flashing (tpy)
Nitrogen	3.95E-03	6.20	0.02	23.45
CO2	0.43	10.74	1.89	23.22
Methane	4.65E-03	2.29	0.02	7.86
Ethane	4.47E-04	0.19	1.96E-03	0.58
Propane	2.72E-05	0.07	1.19E-04	0.24
Isobutane	8.03E-07	0.01	3.52E-06	0.03
n-Butane	1.44E-06	0.02	6.30E-06	0.06
Isopentane	1.43E-07	0.01	6.27E-07	0.02
n-Pentane	6.37E-09	1.60E-03	2.79E-08	0.01
i-C6	6.87E-08	0.03	3.01E-07	0.10
n-Hexane	1.32E-08	0.02	5.79E-08	0.08
Benzene	9.88E-08	2.42E-04	4.33E-07	4.23E-04
Cyclohexane	2.37E-08	1.75E-03	1.04E-07	4.18E-03
i-C7	1.22E-09	0.01	5.35E-09	0.03
n-Heptane	--	--	--	--
Toluene	3.09E-08	3.57E-04	1.35E-07	6.32E-04
2,2,4-Trimethylpentane	1.52E-11	3.35E-05	6.64E-11	1.23E-04
n-Octane	8.70E-12	1.17E-03	3.81E-11	4.99E-03
Ethylbenzene	2.21E-08	8.61E-04	9.67E-08	1.43E-03
m-Xylene	4.85E-08	2.47E-03	2.12E-07	4.45E-03
3-Methyloctane	--	--	--	--
n-Nonane	1.49E-12	4.66E-04	6.53E-12	1.96E-03
H2S	0.07	1.89	0.30	3.88
Water	0.39	0.44	1.72	0.63
C10+	1.42E-12	1.62E-05	6.20E-12	4.79E-05
<b>Total</b>	<b>0.90</b>	<b>21.92</b>	<b>3.94</b>	<b>60.20</b>
<b>Total CO2</b>	<b>0.43</b>	<b>10.74</b>	<b>1.89</b>	<b>23.22</b>
<b>Total Methane</b>	<b>4.65E-03</b>	<b>2.29</b>	<b>0.02</b>	<b>7.86</b>
<b>Total CO<sub>e</sub></b>	<b>0.55</b>	<b>68.06</b>	<b>2.39</b>	<b>219.65</b>
<b>Total VOC</b>	<b>2.99E-05</b>	<b>0.17</b>	<b>1.31E-04</b>	<b>0.59</b>
<b>Total HAP</b>	<b>2.14E-07</b>	<b>0.02</b>	<b>9.35E-07</b>	<b>0.09</b>

**Marathon Oil Company  
Maverick Springs  
Heater Treater Burner Emissions**

Background Information	
Emission Source	B-1
Heater/Boiler rating (MMBtu/hr):	1
Rating above is:	below 100 MMBtu/hr, uncontrolled
Operating hours/year:	8760
Estimated Propane Usage (gal/hr):	10.9290
Fuel Heat Value (Btu/scf) <sup>a</sup> :	2516.10
Fuel Heat Value (Btu/gal) <sup>a</sup> :	91500
Fuel Rate (gal/yr):	95,738

<sup>a</sup> Heating value from AP-42 Table 1.5-1 for Propane (07/2008)

Pollutant	Emission Factor <sup>a</sup> (lb/10 <sup>3</sup> gal)	lb/hr	tpy
VOC	1.1	1.20E-05	5.27E-05
NOx	15	1.64E-04	7.18E-04
CO	8.4	9.18E-05	4.02E-04
PM <sub>10</sub>	0.8	8.74E-06	3.83E-05
PM <sub>2.5</sub>	0.8	8.74E-06	3.83E-05
SO <sub>2</sub>	0.09	9.84E-07	4.31E-06
<b>HAPS</b>			
Arsenic	0.0002	2.19E-09	9.57E-09
Benzene	0.0021	2.30E-08	1.01E-07
Beryllium	0.000012	1.31E-10	5.74E-10
Cadmium	0.0011	1.20E-08	5.27E-08
Chromium	0.0014	1.53E-08	6.70E-08
Cobalt	0.000084	9.18E-10	4.02E-09
Dichlorobenzene	0.0012	1.31E-08	5.74E-08
Formaldehyde	0.075	8.20E-07	3.59E-06
n-Hexane	1.8	1.97E-05	8.62E-05
Lead	0.0005	5.46E-09	2.39E-08
Manganese	0.00038	4.15E-09	1.82E-08
Mercury	0.00026	2.84E-09	1.24E-08
Naphthalene	0.00061	6.67E-09	2.92E-08
Nickel	0.0021	2.30E-08	1.01E-07
POM	0.000088	9.62E-10	4.21E-09
Toluene	0.0034	3.72E-08	1.63E-07
Selenium	0.000024	2.62E-10	1.15E-09
<b>Total HAPs</b>		<b>2.06E-05</b>	<b>9.04E-05</b>
<b>Other Pollutants</b>			
H <sub>2</sub> S	N/A <sup>c</sup>	--	--

<sup>a</sup> Emission factors are taken from AP-42, Chapter 1, Tables 1.5-1 dated July 2008.

<sup>b</sup> SO<sub>2</sub> emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>c</sup> H<sub>2</sub>S emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>d</sup> Greenhouse Gas Factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

<sup>e</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

Parameter	Value
scf/lbmole	379.3
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H <sub>2</sub> S molecular weight	34.08
SO <sub>2</sub> molecular weight	64.06

GHG Pollutant Emissions <sup>d,e</sup>	
GHG CO <sub>2</sub> Factor:	120,000 lb/MMscf
GHG CH <sub>4</sub> Factor:	2.3 lb/MMscf
GHG N <sub>2</sub> O Factor:	2.2 lb/MMscf
GWP CO <sub>2</sub> Equivalent:	1
GWP CH <sub>4</sub> Equivalent:	25
GWP N <sub>2</sub> O Equivalent:	298
CO <sub>2</sub> emissions:	208.89 tpy
CH <sub>4</sub> emissions:	4.00E-03 tpy
N <sub>2</sub> O emissions:	3.83E-03 tpy
CO <sub>2e</sub> emissions:	210.14 tpy

H <sub>2</sub> S Max Concentration (ppmv)	H <sub>2</sub> S Mass to Heater Treater	H <sub>2</sub> S Mass to Heater Treater (tpy)
0	0.00E+00	0.00E+00

<sup>a</sup> H<sub>2</sub>S Mass to Heater Treater (lb/hr) = H<sub>2</sub>S Max Concentration (ppmv) / 10<sup>6</sup> \* Fuel Rate (scf/hr) / Standard Molar Volume (scf/lbmol) \* H<sub>2</sub>S MW (lb/lbmol)

Example Calculation (VOC):

EMISSION FACTOR	FEED RATE PER HOUR	HOURLY EMISSIONS	ANNUAL OPERATING HOURS	WEIGHT CONVERSION	ANNUAL EMISSIONS
1.1 lb VOC / MMscf Natural Gas Burned	10.9290 MMscf / hr	0.00 lb VOC / hr	8,760 hours / yr	1 ton / 2,000 lbs	0.00 tons VOC / yr

Criteria Pollutant Emission Factors obtained from AP-42 Nat Gas Combustion, Table 1.4-1, (7/98) < 100 MMBtu/hr heat input; & Table 1.4-2, (7/98) < 100 MMBtu/hr heat input.

**Marathon Oil Company  
Maverick Springs  
Heater Treater Burner Emissions**

Background Information	
Emission Source	B-2
Heater/Boiler rating (MMBtu/hr):	1
Rating above is:	below 100 MMBtu/hr, uncontrolled
Operating hours/year:	8760
Estimated Propane Usage (gal/hr):	10.9290
Fuel Heat Value (Btu/scf) <sup>a</sup> :	2516.10
Fuel Heat Value (Btu/gal) <sup>a</sup> :	91500
Fuel Rate (gal/yr):	95,738

<sup>a</sup> Heating value from AP-42 Table 1.5-1 for Propane (07/2008)

Pollutant	Emission Factor <sup>a</sup> (lb/10 <sup>3</sup> gal)	lb/hr	tpy
VOC	1.1	1.20E-05	5.27E-05
NOx	15	1.64E-04	7.18E-04
CO	8.4	9.18E-05	4.02E-04
PM <sub>10</sub>	0.8	8.74E-06	3.83E-05
PM <sub>2.5</sub>	0.8	8.74E-06	3.83E-05
SO <sub>2</sub>	0.09	9.84E-07	4.31E-06
<b>HAPS</b>			
Arsenic	0.0002	2.19E-09	9.57E-09
Benzene	0.0021	2.30E-08	1.01E-07
Beryllium	0.000012	1.31E-10	5.74E-10
Cadmium	0.0011	1.20E-08	5.27E-08
Chromium	0.0014	1.53E-08	6.70E-08
Cobalt	0.000084	9.18E-10	4.02E-09
Dichlorobenzene	0.0012	1.31E-08	5.74E-08
Formaldehyde	0.075	8.20E-07	3.59E-06
n-Hexane	1.8	1.97E-05	8.62E-05
Lead	0.0005	5.46E-09	2.39E-08
Manganese	0.00038	4.15E-09	1.82E-08
Mercury	0.00026	2.84E-09	1.24E-08
Naphthalene	0.00061	6.67E-09	2.92E-08
Nickel	0.0021	2.30E-08	1.01E-07
POM	0.000088	9.62E-10	4.21E-09
Toluene	0.0034	3.72E-08	1.63E-07
Selenium	0.000024	2.62E-10	1.15E-09
<b>Total HAPs</b>		<b>2.06E-05</b>	<b>9.04E-05</b>
<b>Other Pollutants</b>			
H <sub>2</sub> S	N/A <sup>c</sup>	--	--

<sup>a</sup> Emission factors are taken from AP-42, Chapter 1, Tables 1.5-1 dated July 2008.

<sup>b</sup> SO<sub>2</sub> emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>c</sup> H<sub>2</sub>S emissions are conservatively based on 100% conversion of H<sub>2</sub>S to SO<sub>2</sub>.

<sup>d</sup> Greenhouse Gas Factors from AP-42, Table 1.4.2 Emission Factors for Criteria Pollutants and Greenhouse Gases from Natural Gas Combustion.

<sup>e</sup> Global Warming Potentials from Table A-1 of Subpart A of Part 98 for Mandatory Greenhouse Gas Reporting.

Parameter	Value
scf/lbmole	379.3
Btu/MMBtu	1,000,000
scf/MMscf	1,000,000
lb/ton	2,000
H <sub>2</sub> S molecular weight	34.08
SO <sub>2</sub> molecular weight	64.06

GHG Pollutant Emissions <sup>d,e</sup>	
GHG CO <sub>2</sub> Factor:	120,000 lb/MMscf
GHG CH <sub>4</sub> Factor:	2.3 lb/MMscf
GHG N <sub>2</sub> O Factor:	2.2 lb/MMscf
GWP CO <sub>2</sub> Equivalent:	1
GWP CH <sub>4</sub> Equivalent:	25
GWP N <sub>2</sub> O Equivalent:	298
CO <sub>2</sub> emissions:	208.89 tpy
CH <sub>4</sub> emissions:	4.00E-03 tpy
N <sub>2</sub> O emissions:	3.83E-03 tpy
CO <sub>2</sub> e emissions:	210.14 tpy

H <sub>2</sub> S Max Concentration (ppmv)	H <sub>2</sub> S Mass to Heater Treater	H <sub>2</sub> S Mass to Heater Treater (tpy)
0	0.00E+00	0.00E+00

<sup>a</sup> H<sub>2</sub>S Mass to Heater Treater (lb/hr) = H<sub>2</sub>S Max Concentration (ppmv) / 10<sup>5</sup> \* Fuel Rate (scf/hr) / Standard Molar Volume (scf/lbmol) \* H<sub>2</sub>S MW (lb/lbmol)

Example Calculation (VOC):

EMISSION FACTOR	FEED RATE PER HOUR	HOURLY EMISSIONS	ANNUAL OPERATING HOURS	WEIGHT CONVERSION	ANNUAL EMISSIONS
1.1 lb VOC / MMscf Natural Gas Burned	10.9290 MMscf / hr	0.00 lb VOC / hr	8,760 hours / yr	1 ton / 2,000 lbs	0.00 tons VOC / yr

Criteria Pollutant Emission Factors obtained from AP-42 Nat Gas Combustion, Table 1.4-1, (7/98) < 100 MMBtu/hr heat input; & Table

Planned MSS - Degassing Due to Passive Expansion / Thermal Expansion / Non-Forced Ventilation

	Run Tank 8083	Overflow Tank 8081	Reject Tank 8080	Heated Slop Oil Tank 8082
MSS Controls?	none	none	none	none
Control Efficiency (%)	0.0%	0.0%	0.0%	0.0%
Event duration, hours/event	1.00	1.00	1.00	1.00
Events per year	1.00	1.00	1.00	1.00
Tank Diameter, ft	12.00	12.00	12.00	21.00
Tank Height, ft	15.00	15.00	15.00	16.00
<sup>a</sup> Vapor Space Volume, ft <sup>3</sup>	848.2	848.2	848.2	2,770.9
<sup>b</sup> Venting Gas MW (lb/lb-mol)	35.87	50.54	35.57	26.48
<sup>a</sup> VOC wt %	0.08%	0.59%	0.09%	0.00%
<sup>b</sup> Benzene wt%	0.00%	0.00%	0.00%	0.00%
<sup>b</sup> H <sub>2</sub> S wt%	0.19%	0.18%	0.20%	0.08%
<sup>b</sup> HAPs wt%	0.03%	0.23%	0.03%	0.00%
<sup>b</sup> CO <sub>2</sub> wt%	0.55%	0.16%	0.52%	0.48%
<sup>b</sup> CH <sub>4</sub> wt%	0.09%	0.00%	0.09%	0.01%
Tank Temperature, °F	66.84	66.84	66.84	66.84
True Vapor Pressure, psia	5.23	5.23	5.23	5.23
Emissions, lb/event	28.11	39.62	27.88	67.82
Hourly Total Emissions, lb/hr	28.11	39.62	27.88	67.82
Annual Total Emissions, TPY	0.01	0.02	0.01	0.03
Total CO <sub>2</sub> , TPY	7.71E-05	3.23E-05	7.27E-05	1.62E-04
Total Methane, TPY	1.26E-05	2.80E-08	1.29E-05	1.75E-06
Total CO <sub>2</sub> e, TPY	3.91E-04	3.30E-05	3.95E-04	2.06E-04
Total VOC, TPY	1.19E-05	1.16E-04	1.26E-05	1.13E-08
Total HAP, TPY	3.70E-06	4.53E-05	3.90E-06	8.04E-11
Total H <sub>2</sub> S, TPY	2.66E-05	3.63E-05	2.81E-05	2.61E-05
Total Benzene, TPY	2.32E-09	2.84E-08	2.45E-09	3.72E-11

Total Emissions	lb/hr	TPY
Total	163.44	0.08
Total CO <sub>2</sub>	0.69	0.00
Total Methane	0.05	0.00
Total CO <sub>2</sub> e	2.05	0.00
Total VOC	0.28	0.00
Total HAP	0.11	0.00
Total H <sub>2</sub> S	0.23	0.00
Total Benzene	0.00	0.00

Ideal Gas Constant, [(ft<sup>3</sup>\*psia)/(R\*lb-mol)]  
10.73159

<sup>a</sup> Assuming 50% of tank is filled

<sup>b</sup> From ProMax Tank Loss Stream

# APPENDIX C

Tribal Minor NSR Registration Forms





**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN  
COUNTRY  
40 CFR 49.151**

**Registration for Existing Sources  
(FORM REG)**

**Use of this information request form is voluntary and not yet approved by the Office of Management and Budget.** The following is a check list of the type of information that Region 8 will use to process information on your registration. While submittal of this form is not required, it does offer details on the information we will use to complete your registration and providing the information requested will help build an existing source emissions inventory. Use of application forms for this program is currently under Office of Management and Budget review and these information request forms will be replaced/updated after that review is completed.

**Please submit information to following two entities:**

Federal Minor NSR Permit Coordinator  
U.S. EPA, Region 8  
1595 Wynkoop Street, 8P-AR  
Denver, CO 80202-1129  
[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

For more information, visit:  
<http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8>

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact:

[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

**A. GENERAL SOURCE INFORMATION**

1. (a) <b>Company Name</b> (Who owns this facility?) <b>Marathon Oil Company</b>		2. <b>Facility Name</b> <b>Maverick Springs Tank Battery</b>	
(b) <b>Operator Name</b> (Is the company that operates this facility different than the company that owns this facility? What is the name of the company?) <b>Marathon Oil Company</b>			
3. Type of Operation <b>Oil Production</b>		4. Portable Source? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
		5. Temporary Source?    Yes <input checked="" type="checkbox"/> No	
6. NAICS Code <b>211111-</b>		7. SIC Code <b>1311</b>	
8. Physical Address (Or, home base for portable sources) <b>N/A</b>			
9. Reservation* <b>Wind River</b>	10. County* <b>Fremont</b>	11a. Latitude (decimal format)* <b>43.48412168</b>	11b. Longitude (decimal format)* <b>-108.9780133</b>
12a. Quarter Quarter Section* <b>NESW</b>	12b. Section* <b>22</b>	12c. Township* <b>6N</b>	12d. Range* <b>2W</b>

\* Provide all locations of operation for portable sources

**B. CONTACT INFORMATION**

<b>Company Contact</b> (Who is the <u>primary</u> contact for the company that owns this facility?) <b>Jon F. Salomonsen</b>		<b>Title</b> <b>Operations Manager</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>jfsalomonsen@marathonoil.com</b>		
Telephone Number <b>(713) 408-8096</b>	Facsimile Number <b>(307) 857-1299</b>	
<b>Operator Contact</b> (Is the company that operates this facility different than the company that owns this facility? Who is the <u>primary</u> contact for the company that operates this source?) <b>Justin LaJeunesse</b>		<b>Title</b> <b>Production Superintendent</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>jlajeunesse@marathonoil.com</b>		
Telephone Number <b>(307) 527-6228 x 2222</b>	Facsimile Number <b>(307) 857-1299</b>	
<b>Permitting Contact</b> (Who is the person <u>primarily</u> responsible for Clean Air Act permitting for the company? We are seeking one main contact for the company. Please do not list consultants.) <b>Donna M. Stevison</b>		<b>Title</b> <b>Advanced HES Professional</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>dmstevison@marathonoil.com</b>		
Telephone Number <b>(307) 254-2760</b>	Facsimile Number <b>(307) 857-1299</b>	
<b>Compliance Contact</b> (Is the person responsible for Clean Air Act compliance for this company different than the person responsible for Clean Air Act permitting? Who is the person <u>primarily</u> responsible for Clean Air Act compliance for the company? We are seeking one main contact for the company. Please do not list consultants.) <b>Donna M. Stevison</b>		<b>Title</b> <b>Advanced HES Professional</b>
Mailing Address <b>1501 Stampede Avenue, Cody, WY 82414</b>		
Email Address <b>dmstevison@marathonoil.com</b>		
Telephone Number <b>(307) 254-2760</b>	Facsimile Number <b>(307) 857-1299</b>	

**C. ATTACHMENTS****Include all of the following information as attachments to this form**

- Narrative description of the operations
- Identification and description of all emission units and air pollution generating activities (with the exception of the exempt emissions units and activities listed in §49.153(c))
- Identification and description of any existing air pollution control equipment and compliance monitoring devices or activities
- Type and amount of each fuel used
- Type raw materials used
- Production Rates
- Operating Schedules
- Any existing limitations on source operations affecting emissions or any work practice standards, where applicable, for all regulated NSR pollutants at your source.
- Total allowable (potential to emit if there are no legally and practically enforceable restrictions) emissions from the air pollution source for the following air pollutants: particulate matter, PM<sub>10</sub>, PM<sub>2.5</sub>, sulfur oxides (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub>), hydrogen sulfide (H<sub>2</sub>S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.
- Estimates of the total actual emissions from the air pollution source for the following air pollutants: particulate matter, PM<sub>10</sub>, PM<sub>2.5</sub>, sulfur oxides (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), volatile organic compound (VOC), lead (Pb) and lead compounds, fluorides (gaseous and particulate), sulfuric acid mist (H<sub>2</sub>SO<sub>4</sub>), hydrogen sulfide (H<sub>2</sub>S), total reduced sulfur (TRS) and reduced sulfur compounds, including all calculations for the estimates.
- Other

The public reporting and recordkeeping burden for this collection of information is estimated to average 6 hours per response. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques to the Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822T), 1200 Pennsylvania Ave., NW, Washington, D.C. 20460. Include the OMB control number in any correspondence. Do not send the completed form to this address.

**D. TABLE OF ESTIMATED EMISSIONS**

The following estimates of the total emissions in tons/year for all pollutants contained in your worksheet stated above should be provided.

<b>Pollutant</b>	<b>Total Actual Emissions (tpy)</b>	<b>Total Allowable or Potential Emissions (TPY)</b>	
<b>PM</b>	<b>7.66E-05</b>	<b>7.66E-05</b>	PM - Particulate Matter PM <sub>10</sub> - Particulate Matter less than 10 microns in size PM <sub>2.5</sub> - Particulate Matter less than 2.5 microns in size SO <sub>2</sub> - Sulfur Oxides NO <sub>x</sub> - Nitrogen Oxides CO - Carbon Monoxide VOC - Volatile Organic Compound Pb - Lead and lead compounds Fluorides - Gaseous and particulates H <sub>2</sub> SO <sub>4</sub> - Sulfuric Acid Mist H <sub>2</sub> S - Hydrogen Sulfide TRS - Total Reduced Sulfur RSC - Reduced Sulfur Compounds
<b>PM<sub>10</sub></b>	<b>7.66E-05</b>	<b>7.66E-05</b>	
<b>PM<sub>2.5</sub></b>	<b>7.66E-05</b>	<b>7.66E-05</b>	
<b>SO<sub>2</sub></b>	<b>8.62E-06</b>	<b>8.62E-06</b>	
<b>NO<sub>x</sub></b>	<b>1.44E-03</b>	<b>1.44E-03</b>	
<b>CO</b>	<b>8.04E-04</b>	<b>8.04E-04</b>	
<b>VOC</b>	<b>19.17</b>	<b>19.86</b>	
<b>Pb</b>	--	--	
<b>Fluorides</b>	--	--	
<b>H<sub>2</sub>SO<sub>4</sub></b>	--	--	
<b>H<sub>2</sub>S</b>	<b>39.12</b>	<b>49.13</b>	
<b>TRS</b>	--	--	
<b>RSC</b>	--	--	

Emissions calculations must include fugitive emissions if the source is one the following listed sources, pursuant to CAA Section 302(j):

- (a) Coal cleaning plants (with thermal dryers);
- (b) Kraft pulp mills;
- (c) Portland cement plants;
- (d) Primary zinc smelters;
- (e) Iron and steel mills;
- (f) Primary aluminum ore reduction plants;
- (g) Primary copper smelters;
- (h) Municipal incinerators capable of charging more than 250 tons of refuse per day;
- (i) Hydrofluoric, sulfuric, or nitric acid plants;
- (j) Petroleum refineries;
- (k) Lime plants;
- (l) Phosphate rock processing plants;
- (m) Coke oven batteries;
- (n) Sulfur recovery plants;
- (o) Carbon black plants (furnace process);
- (p) Primary lead smelters;
- (q) Fuel conversion plants;
- (r) Sintering plants;
- (s) Secondary metal production plants;
- (t) Chemical process plants
- (u) Fossil-fuel boilers (or combination thereof) totaling more than 250 million British thermal units per hour heat input;
- (v) Petroleum storage and transfer units with a total storage capacity exceeding 300,000 barrels;
- (w) Taconite ore processing plants;
- (x) Glass fiber processing plants;
- (y) Charcoal production plants;
- (z) Fossil fuel-fired steam electric plants of more than 250 million British thermal units per hour heat input, and
- (aa) Any other stationary source category which, as of August 7, 1980, is being regulated under section 111 or 112 of the Act.

# APPENDIX D

Laboratory Analyses



EXTENDED LIQUID ANALYSIS

**SAMPLE DATA**

PROJECT NO..... LARC8066  
COMPANY NAME..... Arcadis, Inc  
SITE..... Maverick Springs  
UNIT ID..... Heater Treater #2  
SAMPLED BY..... DW

SAMPLE ID..... Pressurized Liquid  
ANALYSIS DATE..... 6/14/2016  
SAMPLE DATE..... 6/9/2016  
CYLINDER NO..... 40098  
LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... 10 psig  
AMBIENT PRESSURE..... 11.5 psi

SAMPLE TEMP..... 117 F  
AMBIENT TEMP..... 77 F

COMMENTS: Separator Gauge Readings: 7 psig, 125 F. Sample Probe Pressure: 10 psig. IR Gun Surface Temperature: 116-117 F.

**LABORATORY DATA**

COMPONENT	MOLE %	WT%	LV%
METHANE.....	0.1070	0.0063	0.0160
ETHANE.....	0.0000	0.0000	0.0000
PROPANE.....	0.0000	0.0000	0.0000
ISOBUTANE.....	0.0000	0.0000	0.0000
N-BUTANE.....	0.0000	0.0000	0.0000
ISOPENTANE.....	0.0210	0.0055	0.0068
N-PENTANE.....	0.0167	0.0044	0.0054
CYCLOPENTANE.....	0.0129	0.0033	0.0034
N-HEXANE.....	2.0100	0.6323	0.7308
CYCLOHEXANE.....	0.0279	0.0086	0.0084
OTHER HEXANES.....	0.8893	0.2765	0.3000
OTHER HEPTANES.....	1.0518	0.3834	0.4197
METHYLCYCLOHEXANE.....	0.0812	0.0291	0.0289
2,2,4 TRIMETHYLPENTANE.....	0.0058	0.0024	0.0026
BENZENE.....	0.0000	0.0000	0.0000
TOLUENE.....	0.0000	0.0000	0.0000
ETHYLBENZENE.....	0.0819	0.0317	0.0279
XYLENES.....	0.2625	0.1017	0.0891
OTHER OCTANES.....	2.4439	1.0122	1.0614
NONANES.....	3.2548	1.5227	1.5609
DECANES PLUS.....	89.7332	95.9798	95.7386
<b>TOTAL</b>	<b>100.00000</b>	<b>100.00000</b>	<b>100.00000</b>

SAMPLE FRACTIONS	TOTAL	C6+	C10+
SPG LIQUID.....	0.77	0.77	0.90
API GRAVITY.....	52.9	52.9	26.5
MOLECULAR WEIGHT.....	273.9	274.3	293.0
ABSOLUTE DENSITY (lbs/gal).....	6.4	6.4	7.5
HEATING VALUE LIQUID IDL GAS (GBTU/gal).....	36740.9	130860.2	131573.9
GBTU/GAL LIQUID.....	130278.8	130298.7	130533.5
NBTU/GAL LIQUID.....	121123.2	121129.5	142511.1
VAPOR/LIQUID (SCF/gal).....	12.3	12.3	13.9
VAPOR PRESSURE (psia).....	5.6	0.2	0.0

ANALYTICAL PROCEDURES TAKEN FROM ASTM D6730-01(2011), ASTM D7169



**AIR  
POLLUTION  
TESTING, INC.**  
DENVER, SALT LAKE CITY

5530 Marshall Street  
Arvada, Colorado 80002  
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**EXTENDED LIQUID ANALYSIS**  
**DHA COMPONENT ANALYSIS**

**SAMPLE DATA**

PROJECT NO. .... LARC6066  
COMPANY NAME ..... Arcadis, Inc.  
SITE ..... Maverick Springs  
UNIT ID ..... Heater Treater #2  
SAMPLED BY ..... DW

SAMPLE ID ..... Pressurized Liquid  
ANALYSIS DATE ..... 6/14/2016  
SAMPLE DATE ..... 6/9/2016  
CYLINDER NO ..... 40098  
LAB ANALYST ..... CB

**FIELD DATA**

SAMPLE PRESSURE ..... 10 psig  
AMBIENT PRESSURE ..... 11.5 psi

SAMPLE TEMP ..... 117 F  
AMBIENT TEMP ..... 77 F

COMMENTS: Separator Gauge Readings: 7 psig, 125 F. Sample Probe Pressure: 10 psig. IR Gun Surface Temperature: 116-117 F.

**LABORATORY DATA**

COMPONENT	MOLE %	WT%	LV%
Methane	0.1070	0.0063	0.0160
Ethane	0.0000	0.0000	0.0000
Propane	0.0000	0.0000	0.0000
Isobutane	0.0000	0.0000	0.0000
n-Butane	0.0000	0.0000	0.0000
Cyclopentane	0.0129	0.0033	0.0034
Isopentane	0.0210	0.0055	0.0068
n-Pentane	0.0167	0.0044	0.0054
Unknown C5s	0.0000	0.0000	0.0000
Neopentane	0.0000	0.0000	0.0000
Benzene	0.0000	0.0000	0.0000
Methylcyclopentane	0.4424	0.1359	0.1383
Cyclohexane	0.0279	0.0086	0.0084
2,2-Dimethylbutane	0.0058	0.0018	0.0022
Neohexane	0.0000	0.0000	0.0000
2-Methylpentane	0.0784	0.0247	0.0288
2,3-Dimethylbutane	0.0046	0.0015	0.0017
3-Methylpentane	0.3580	0.1126	0.1291
Unknown C6s	0.0000	0.0000	0.0000
n-Hexane	2.0100	0.6323	0.7308
Toluene	0.0000	0.0000	0.0000
1,1-Dimethylcyclopentane	0.0095	0.0034	0.0034
1,t-3-Dimethylcyclopentane	0.0499	0.0179	0.0182
1,c-3-Dimethylcyclopentane	0.0194	0.0069	0.0071
1,t-2-Dimethylcyclopentane	0.0000	0.0000	0.0000
Methylcyclohexane	0.0812	0.0291	0.0289
1,c-2-Dimethylcyclopentane	0.0000	0.0000	0.0000
Ethylcyclopentane	0.1004	0.0360	0.0358
Cycloheptane	0.0000	0.0000	0.0000
2,2-Dimethylpentane	0.0078	0.0028	0.0032
2,4-Dimethylpentane	0.0511	0.0187	0.0212
2,2,3-Trimethylbutane	0.0000	0.0000	0.0000
3,3-Dimethylpentane	0.0083	0.0030	0.0033
2-Methylhexane	0.1518	0.0555	0.0623
2,3-Dimethylpentane	0.0981	0.0359	0.0393
3-Methylhexane	0.2455	0.0898	0.0996
3-Ethylpentane	0.0336	0.0123	0.0134
n-Heptane	0.2765	0.1011	0.1128
Triptane	0.0000	0.0000	0.0000
Unknown C7s	0.0000	0.0000	0.0000
Styrene	0.0000	0.0000	0.0000
Ethylbenzene	0.0819	0.0317	0.0279

o-Xylene	0.1431	0.0555	0.0481
m-Xylene	0.0000	0.0000	0.0000
p-Xylene	0.1194	0.0463	0.0410
1,1,3-Trimethylcyclopentane	0.0000	0.0000	0.0000
1,1,2,3-Trimethylcyclopentane	0.0454	0.0186	0.0190
1,1,2,4-Trimethylcyclopentane	0.0625	0.0256	0.0259
1,1,3-Dimethylcyclohexane	0.0056	0.0023	0.0023
1,1,4-Dimethylcyclohexane	0.0644	0.0264	0.0264
1,1-Dimethylcyclohexane	0.0320	0.0131	0.0128
1-Methyl-c-3-ethylcyclopentane	0.0468	0.0192	0.0189
1-Methyl-t-2-ethylcyclopentane	0.0662	0.0271	0.0269
1,1,2-Trimethylcyclopentane	0.0644	0.0264	0.0261
1,1,2,4-Trimethylcyclopentane	0.0000	0.0000	0.0000
1,1,2,3-Trimethylcyclopentane	0.2187	0.0896	0.0887
1-Methyl-t-3-ethylcyclopentane	0.0386	0.0158	0.0158
1-Methyl-1-ethylcyclopentane	0.0000	0.0000	0.0000
1,1,3-Dimethylcyclohexane	0.0000	0.0000	0.0000
1,1,4-Dimethylcyclohexane	0.0000	0.0000	0.0000
1,1,2,3-Trimethylcyclopentane	0.0655	0.0268	0.0263
Isopropylcyclopentane	0.0326	0.0134	0.0131
1-Ethyl-c-2-methylcyclopentane	0.0000	0.0000	0.0000
1,1,2-Dimethylcyclohexane	0.0173	0.0071	0.0068
n-Propylcyclopentane	0.1827	0.0748	0.0735
Ethylcyclohexane	0.0000	0.0000	0.0000
Cyclooctane	0.0000	0.0000	0.0000
n-Octane	0.3940	0.1643	0.1785
Unknown C8s	0.0104	0.0043	0.0047
Diisobutyl	0.0000	0.0000	0.0000
Isooctane	0.0000	0.0000	0.0000
2,2,4-Trimethylpentane	0.0058	0.0024	0.0026
2,2-Dimethylhexane	0.0255	0.0106	0.0117
2,4-Dimethylhexane	0.0912	0.0380	0.0414
2,5-Dimethylhexane	0.0000	0.0000	0.0000
2,2,3-Trimethylpentane	0.0000	0.0000	0.0000
3,3-Dimethylhexane	0.0271	0.0113	0.0121
2,3,4-Trimethylpentane	0.0072	0.0030	0.0032
2,3-Dimethylhexane	0.0667	0.0278	0.0298
2-Methylheptane	0.4220	0.1760	0.1922
4-Methylheptane	0.1515	0.0632	0.0683
3-Methylheptane	0.2436	0.1016	0.1097
3,4-Dimethylhexane	0.0622	0.0259	0.0275
3-Ethylhexane	0.0000	0.0000	0.0000
C9	3.2548	1.5227	1.5609
C10	5.0442	2.6200	2.7373
C11	4.8333	2.7580	2.8425
C12	4.5208	2.8112	2.8634
C13	5.1790	3.4857	3.5165
C14	4.8962	3.5460	3.5460
C15	4.5283	3.5115	3.4886
C16	4.0352	3.3358	3.3141
C17	3.9345	3.4539	3.4314
C18	3.7809	3.5128	3.4899
C19	3.5397	3.4699	3.4473
C20	3.2374	3.3393	3.3175
C21	2.5643	2.7763	2.7582
C22	2.7495	3.1177	3.0974
C23	2.1808	2.5845	2.5677
C24	2.0522	2.5372	2.5207
C25	1.9129	2.4629	2.4468
C26	1.6420	2.1982	2.1839
C27	1.6627	2.3110	2.2959
C28	1.3688	1.9727	1.9599
C29	1.2754	1.9033	1.8909
C30+	24.7950	38.2720	38.0228
TOTAL	100.0000	100.0000	100.0000



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**EXTENDED LIQUIDS ANALYSIS  
 BY CARBON NUMBER**

**SAMPLE DATA**

PROJECT NO..... LARC6066  
 COMPANY NAME..... Arcadis, Inc.  
 SITE..... Maverick Springs  
 UNIT ID..... Heater Treater #2  
 SAMPLED BY..... DW

SAMPLE ID..... Pressurized Liquid  
 ANALYSIS DATE..... 6/14/2016  
 SAMPLE DATE..... 6/9/2016  
 CYLINDER NO..... 40098  
 LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... 10 psig  
 AMBIENT PRESSURE..... 11.5 psi

SAMPLE TEMP..... 117 F  
 AMBIENT TEMP..... 77 F

COMMENTS: Separator Gauge Readings: 7 psig, 125 F. Sample Probe Pressure: 10 psig. IR Gun Surface Temperature: 116-117 F.

**LABORATORY DATA**

COMPONENT	MOLE %	WT%	LV%
C1	0.1070	0.0063	0.0160
C2	0.0000	0.0000	0.0000
C3	0.0000	0.0000	0.0000
C4	0.0000	0.0000	0.0000
C5	0.0506	0.0132	0.0155
C6	2.9273	0.9175	1.0393
C7	1.1330	0.4125	0.4485
C8	2.7941	1.1481	1.1810
C9	3.2548	1.5227	1.5609
C10	5.0442	2.6200	2.7373
C11	4.8333	2.7580	2.8425
C12	4.5208	2.8112	2.8634
C13	5.1790	3.4857	3.5165
C14	4.8962	3.5460	3.5460
C15	4.5283	3.5115	3.4886
C16	4.0352	3.3358	3.3141
C17	3.9345	3.4539	3.4314
C18	3.7809	3.5128	3.4899
C19	3.5397	3.4699	3.4473
C20	3.2374	3.3393	3.3175
C21	2.5643	2.7763	2.7582
C22	2.7495	3.1177	3.0974
C23	2.1808	2.5845	2.5677
C24	2.0522	2.5372	2.5207
C25	1.9129	2.4629	2.4468
C26	1.6420	2.1982	2.1839
C27	1.6627	2.3110	2.2959
C28	1.3688	1.9727	1.9599
C29	1.2754	1.9033	1.8909
C30+	24.7950	38.2720	38.0228
TOTAL	100.0000	100.0000	100.0000

The following files were used in generating this report:  
 C:\Chem32\2\DATA\DHAI40098\_06202016\_0902.csv  
 C:\AscentSimdis\Output\Maverick Springs\_06202016.csv



**AIR  
POLLUTION  
TESTING, INC.**  
DENVER, SALT LAKE CITY

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Arvada, Colorado 80002  
Phone: 303-420-5949  
Fax: 303-420-5920

PHYSICAL PROPERTY TESTING

**SAMPLE DATA**

PROJECT NO..... LARC6066  
COMPANY NAME..... Arcadis, Inc.  
SITE..... Maverick Springs  
UNIT ID..... Tank  
SAMPLED BY..... DW

SAMPLE ID..... Sales Oil  
ANALYSIS DATE..... 42535  
SAMPLE DATE..... 42530  
CYLINDER NO..... Jar  
LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... 10 psig  
AMBIENT PRESSURE..... 11.5 psi

SAMPLE TEMP..... 117 F  
AMBIENT TEMP..... 77 F

COMMENTS:

**LABORATORY DATA**

API GRAVITY = 22.7

REID VAPOR PRESSURE = 0.90 psi

NOTES: API GRAVITY MEASURED USING ASTM D6377/D6378

VAPOR PRESSURE MEASURED USING ASTM D1298/D287

**EXTENDED GAS ANALYSIS**

**SAMPLE DATA**

PROJECT NO..... LARC6066  
COMPANY NAME..... Arcadis, Inc.  
SITE..... Maverick Springs  
UNIT ID..... Heater Treater #2  
SAMPLED BY..... DW

SAMPLE ID..... Liberated Gas  
ANALYSIS DATE..... 6/17/2016  
SAMPLE DATE..... 6/15/2016  
CYLINDER NO..... 38672  
LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... 9 psig  
AMBIENT PRESSURE..... 11.5 psi

SAMPLE TEMP..... 113 F  
AMBIENT TEMP..... 60 F

COMMENTS: Gas to Oil Ratio = Below MDL (0.5 scf/bbl)

**LABORATORY DATA**

COMPONENT	MOLE %	WT%	GPM
HYDROGEN SULFIDE.....	5.3563	4.8091	0.7277
CARBON DIOXIDE.....	25.0291	29.0192	4.2925
NITROGEN.....	31.8108	23.4766	3.5170
METHANE.....	26.0161	10.9953	4.4323
ETHANE.....	0.1946	0.1541	0.0523
PROPANE.....	0.1083	0.1259	0.0300
ISOBUTANE.....	0.0795	0.1217	0.0261
N-BUTANE.....	0.1363	0.2087	0.0432
ISOPENTANE.....	0.2583	0.4909	0.0949
N-PENTANE.....	0.1387	0.2637	0.0505
CYCLOPENTANE.....	0.0932	0.1722	0.0277
N-HEXANE.....	1.1800	2.6789	0.4876
CYCLOHEXANE.....	0.1314	0.2913	0.0449
OTHER HEXANES.....	1.0033	2.2777	0.4146
HEPTANES.....	1.3152	3.4720	0.6100
METHYLCYCLOHEXANE.....	0.0670	0.1732	0.0270
2,2,4 TRIMETHYLPENTANE.....	0.0249	0.0749	0.0126
BENZENE.....	0.0044	0.0091	0.0012
TOLUENE.....	0.0465	0.1128	0.0156
ETHYLBENZENE.....	0.0109	0.0305	0.0042
XYLENES.....	0.0449	0.1256	0.0175
C8+ HEAVIES.....	6.9505	20.9166	3.5762
SUBTOTAL	100.0000	100.0000	18.5058
OXYGEN/ARGON	0.0000	0.0000	0.0000
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>18.5058</b>

**BTU @**

MOLECULAR WEIGHT.....	37.9583	NET DRY REAL	879.9065 /scf
RELATIVE DENSITY (AIR=1).....	1.3106	GROSS DRY REAL	963.2939 /scf
COMPRESSIBILITY FACTOR.....	0.9925	GROSS WET REAL	946.9351 /scf

**FLASH LIBERATION ANALYSIS OF SEPARATOR LIQUID**

**SAMPLE DATA**

PROJECT NO..... LARC6066  
COMPANY NAME..... Arcadis, Inc.  
SITE..... Maverick Springs  
UNIT ID..... FWKO #3  
SAMPLED BY..... DW

SAMPLE ID..... Produced Water  
ANALYSIS DATE..... 6/14/2016  
SAMPLE DATE..... 6/9/2016  
CYLINDER NO..... 40047  
LAB ANALYST..... CB

**FIELD DATA**

SAMPLE PRESSURE..... 21 psig  
AMBIENT PRESSURE..... 11.5 psi

SAMPLE TEMP..... 86 F  
AMBIENT TEMP..... 77 F

COMMENTS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Flash Liberation of Hydrocarbon Liquid**

	Pressure	Temperature
Separator Produced Water	21 psig	86 °F
Stock Tank	0 psig	70 °F
Base Conditions	14.65 psi	60 °F

**Flash Liberation Results**

	Result	Units
Gas Water Ratio	0.8	SCF flashed gas/bbl stock tank liquid
Gas Specific Gravity	1.2735	Air = 1.00

**Flashed Gas Extended Analysis**

**SAMPLE DATA**

PROJECT NO.....	LARC6066	SAMPLE ID.....	Flashed Gas
COMPANY NAME.....	Arcadis, Inc.	ANALYSIS DATE.....	6/14/2016
SITE.....	Maverick Springs	SAMPLE DATE.....	6/9/2016
UNIT ID.....	FWKO #3	CYLINDER NO.....	40047
SAMPLED BY.....	DW	LAB ANALYST.....	CB

**LAB CONDITIONS**

PRESSURE.....	12.2 psi	TEMPERATURE.....	70 F
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COMMENTS:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**LABORATORY DATA**

COMPONENT	MOLE %	WT%	GPM
HYDROGEN SULFIDE.....	4.0408	3.7336	0.5470
CARBON DIOXIDE.....	54.3094	64.7995	9.2806
NITROGEN.....	26.7798	20.3387	2.9501
METHANE.....	12.2335	5.3207	2.0767
ETHANE.....	0.5665	0.4618	0.1517
PROPANE.....	0.2561	0.3061	0.0706
ISOBUTANE.....	0.0476	0.0750	0.0156
N-BUTANE.....	0.1173	0.1848	0.0370
ISOPENTANE.....	0.0429	0.0838	0.0157
N-PENTANE.....	0.0435	0.0851	0.0158
CYCLOPENTANE.....	0.0000	0.0000	0.0000
N-HEXANE.....	0.1268	0.2964	0.0522
CYCLOHEXANE.....	0.0124	0.0283	0.0042
OTHER HEXANES.....	0.1048	0.2448	0.0432
HEPTANES.....	0.0258	0.0700	0.0119
METHYLCYCLOHEXANE.....	0.0106	0.0283	0.0043
2,2,4 TRIMETHYLPENTANE.....	0.0000	0.0000	0.0000
BENZENE.....	0.0086	0.0182	0.0024
TOLUENE.....	0.0261	0.0652	0.0087
ETHYLBENZENE.....	0.0034	0.0099	0.0013
XYLENES.....	0.0148	0.0426	0.0057
C8+ HEAVIES.....	1.2293	3.8070	0.6302
SUBTOTAL	100.0000	100.0000	15.9250
OXYGEN/ARGON	0.0000	0.0000	0.0000
<b>TOTAL</b>	<b>100</b>	<b>100</b>	<b>15.9250</b>

**BTU @**

MOLECULAR WEIGHT.....	36.8850	NET DRY REAL	244.3667 /scf
RELATIVE DENSITY (AIR=1).....	1.2735	GROSS DRY REAL	268.4436 /scf
COMPRESSIBILITY FACTOR.....	0.9961	GROSS WET REAL	263.8649 /scf

Arcadis U.S., Inc.

1717 West 6th Street

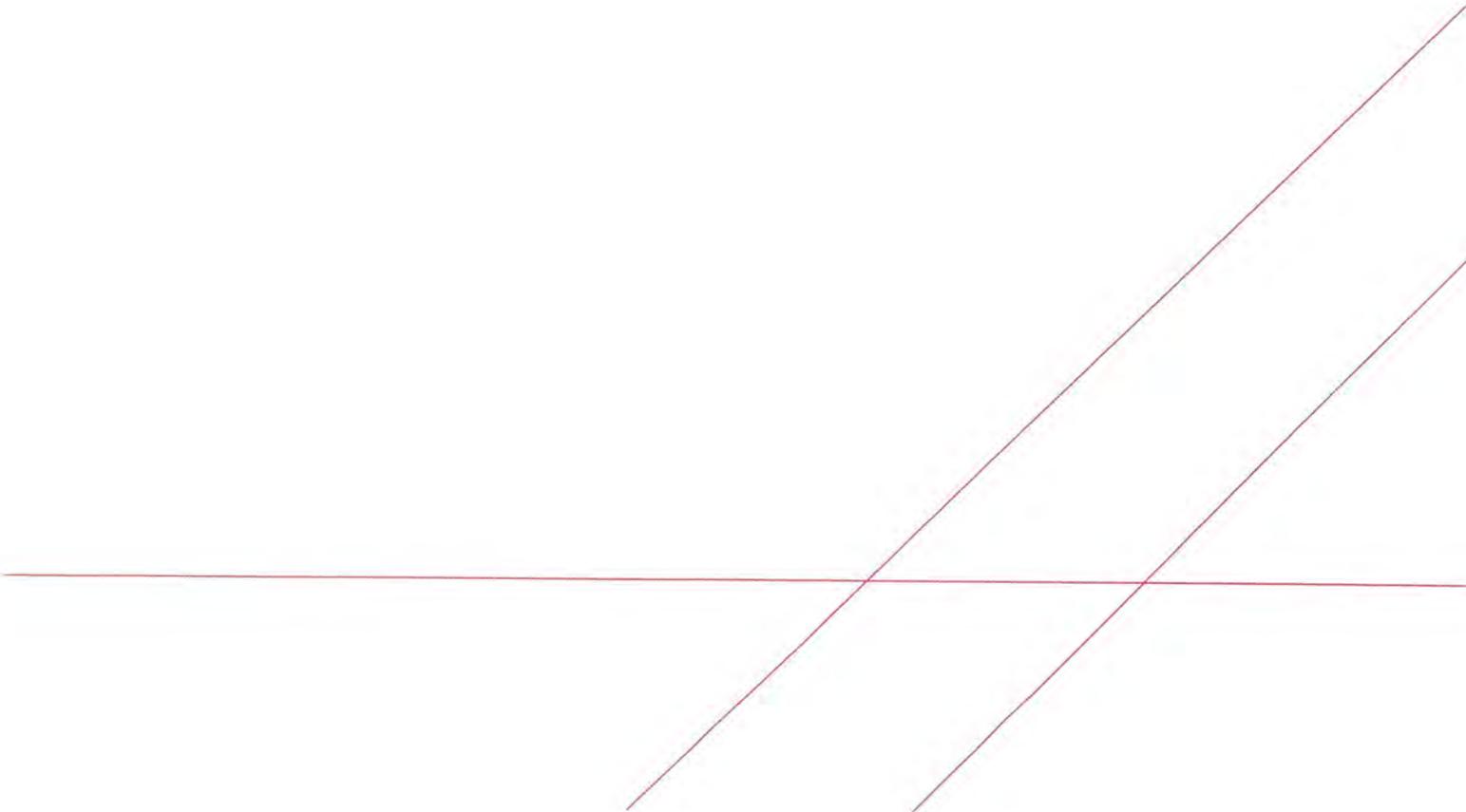
Suite 210

Austin, Texas 78703

Tel 512 451 1188

Fax 512 451 2930

[www.arcadis.com](http://www.arcadis.com)



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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
FEDERAL MINOR NEW SOURCE REVIEW PROGRAM IN INDIAN COUNTRY  
40 CFR 49.151

**Change in Company Ownership Notification**  
(Form OWN)

Use of this information request form is voluntary and not approved by the Office of Management and Budget. The following is a check list of the type of information that Region 8 will use to process information on your change in ownership notification. While submittal of this form is not required, it does offer details on the information we will use to process the change in ownership. Use of application forms for this program is currently under Office of Management and Budget review and these information request forms will be replaced/updated after that review is completed.

**Please submit information to following two entities:**

Federal Minor NSR Permit Coordinator  
U.S. EPA, Region 8  
1595 Wynkoop Street, 8P-AR  
Denver, CO 80202-1129  
[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov)

For more information, visit:  
<http://www.epa.gov/caa-permitting/tribal-nsr-permitting-region-8>

The Tribal Environmental Contact for the specific reservation:

If you need assistance in identifying the appropriate Tribal Environmental Contact and address, please contact  
[R8airpermitting@epa.gov](mailto:R8airpermitting@epa.gov).

**FACILITY INFORMATION**

**Facility Name and Description**

See the attached excel spreadsheet for all facility information as the change of ownership encompasses 7 facilities on the Wind River Reservation. These facilities include Steamboat Butte C1, Steamboat Butte C3, Steamboat Butte E5, Steamboat Butte Brinkerhoff Battery, Maverick Springs, Circle Ridge, and Chatterton.

**Minor Source Permit To Construct Number**

**Physical Address** (home base for portable sources)  
27 Maverick Springs Rd. Kinnear, WY 82516

<b>Reservation</b> Wind River	<b>County*</b> Fremont	<b>Latitude</b> (decimal format)* See Attached	<b>Longitude</b> (decimal format)* See Attached
<b>Quarter Quarter Section*</b> See Attached	<b>Section*</b> See Attached	<b>Township*</b> See Attached	<b>Range*</b> See Attached

\*Provide all proposed locations of operation for portable sources

**NEW COMPANY****PREVIOUS COMPANY**

<b>Company Name</b> (Who owns this facility?) Merit Energy Company	<b>Company Name</b> (Who was the previous owner?) Marathon Oil Company
<b>New Company Contact/Title</b> (Who is the <u>primary</u> contact for the new company that owns this facility?) Michelle Koch / Regulatory and Government Affairs Professional	
<b>Mailing Address</b>  1501 Stampede Ave. #9010, Cody, WY 82414	
<b>Email Address</b> Michelle.Koch@meritenergy.com	
<b>Telephone Number</b> Office: 307-527-2103 Cell: 567-525-6160	
<b>Facsimile Number</b>	

**INFORMATION ON HOW TO HANDLE MULTIPLE SITES**

On a separate piece of paper continue the list of the facility source name, permit number, and location descriptions for each facility/source for which ownership has changed.

The undersigned, as an authorized representative of the company, acknowledges that the above information is correct, and requests that the name change be made in all Air Permitting records.

**AUTHORIZATION**

New Company Merit Energy Company	Previous Company Marathon Oil Company
Company Owner's Signature 	Previous Company Owner's Signature 
Name (Please Print) Bob Georgius	Name (Please Print) M. Paul Peacock
Title Operations Manager	Title Corporate Environmental & Regulatory Compliance Manager

Wind River Facilities	Physical Address	Reservation	County	Lat	Long	Quarter-Quarter Section	Section	Township	Range	Permit Applications/Registrations Submitted
Steamboat Butte C1	27 Maverick Springs Rd. Kinnear, WY 82516	Wind River	Fremont			SW/4		32 4N	1W	Title V Permit Application (C1C3 permitted together)
Steamboat Butte C3	27 Maverick Springs Rd. Kinnear, WY 82516	Wind River	Fremont			NW/4		32 4N	1W	Title V Permit Application (C1C3 permitted together)
Steamboat Butte E5	27 Maverick Springs Rd. Kinnear, WY 82516	Wind River	Fremont	43.26523889	-108.904444			5 3N	1W	Title V Permit Application
Seamboat Butte Brinkerhoff Tank Battery	27 Maverick Springs Rd. Kinnear, WY 82516	Wind River	Fremont	43.25639	-108.89129	NWNW		9 3N	1W	USEPA Federal Minor NSR Program Registration
Maverick Springs	27 Maverick Springs Rd. Kinnear, WY 82516	Wind River	Fremont	43.48412168	-108.9780133	NESW		22 6N	2W	USEPA Federal Minor NSR Program Registration
Circle Ridge	27 Maverick Springs Rd. Kinnear, WY 82516	Wind River	Fremont	43.525326	-109.046092	NESW		6 6N	2W	Federal New Source Review Program Synthetic Minor Application
Chatterton	27 Maverick Springs Rd. Kinnear, WY 82516	Wind River	Fremont	43.50164784	-108.9874665	NESW		15 6N	2W	USEPA Federal Minor NSR Program Registration

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Reservation	County*	Latitude (decimal format)*	Longitude (decimal format)*
Wind River	Fremont	See Attached	See Attached
Quarter Quarter Section*	Section*	Township*	Range*
See Attached	See Attached	See Attached	See Attached

\*Provide all proposed locations of operation for portable sources

Folder  
109597

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